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ROHDE (T.). **Schüttegefährdung verschiedener Douglasien-'Herkünfte'.** [The liability to needle-fall of Douglas Firs of diverse origins.]—*Z. Forst- u. Jagdw.*, lxviii, 11, pp. 610–616, 2 diags., 2 graphs, 1936.

The control of the needle-fall of Douglas firs [*Pseudotsuga taxifolia*] due to *Rhabdocline* [*pseudotsugae*: *R.A.M.*, xvi, p. 147] by eradication of diseased trees being apparently impracticable, efforts must be made to reduce the extent of the damage by the selection of resistant types. With this end in view, the writer laid out a test plot with material of 17 diverse origins close to a diseased stand near the North Sea coast. Although no hard-and-fast correlation could be detected between the incidence of infection and the source of the trees (1,111 out of 3,984 of which developed needle-fall symptoms), the three *caesia* groups showed a remarkable degree of resistance compared with the representatives of *glauca* and *viridis*. It was noticed that in many trees the lower branches, overgrown with grass, were severely attacked while the upper ones remained healthy; in the former case the adhesion and germination of the spores was probably promoted by humidity.

HANSBROUGH (J. R.). **The Tympanis canker of Red Pine.**—*Bull. Yale Univ. Sch. For.* 43, ix+58 pp., 12 pl., 2 figs., 5 graphs, 1936.

In this paper [a shorter version of which has already been noticed from another source: *R.A.M.*, xiv, p. 612] describing in detail his investigations into the canker disease of red pine (*Pinus resinosa*) caused in North America by a fungus previously identified as *Tympanis pinastri* [ibid., xvi, p. 8], the author states that J. W. Groves has pointed out in an unpublished thesis (Toronto) that Tulasne's name can only be applied to *T. pinastri* occurring on the true firs (*Abies* spp.). The fungus causing this disease is therefore designated *Tympanis* sp. pending further work on its identity.

The condition only occurs south of the optimum range of red pines, and is generally worse on poor than on good sites, infection being inversely related to vigour as expressed in height and diameter growth of paired trees. The fungus is a weak parasite of red pine, and causes disease only when the host is debilitated by environmental conditions.

Individual infected trees may be killed outright by girdling of the main stem, or they may remain alive indefinitely. A permanent disfigurement of the bole usually results, brought about through resin

infiltration of the wood under the canker, through decay of the wood by secondary fungi which have gained access through the open cankers, by discoloration of the sapwood owing to staining organisms, or through breaking of the main stem at the cankers.

Loss caused by the disease is unlikely to exceed 10 per cent. of the expectation value of the stands. In individual plantations a light, scattered infection may even act as a beneficial thinning. Mixed planting with white pine [*P. strobus*], 8-ft. spacing, and judiciously timed pruning and thinning offer an appreciable degree of control. No special sanitation measures are recommended.

BAVENDAMM (W.). **Die Grauschimmelfäule der Nadelhölzer.** [The grey mould rot of conifers.]—*Tharandt. forstl. Jb.*, lxxxvii, 11, pp. 853–856, 2 figs., 1936.

This is a popular note on the infection of conifers, e.g., *Abies* and *Picea* spp. and *Pseudotsuga douglasii* [*P. taxifolia*] by *Sclerotinia fuckeliana*, the ascigerous stage of *Botrytis cinerea* [*R.A.M.*, xii, pp. 316, 340], the grey rot caused by which is stated to be very prevalent in Germany in wet seasons such as 1936, when it assumed a semi-parasitic form. The disease caused in the spring a yellowing, dying-off, and falling of the needles and desiccation of the shoots, which curled over, mostly in a downward direction. The conidial stage of the fungus develops from the black sclerotia formed at the base of the dead shoots in the autumn.

ROBERTSON (W. A.). **Report of the Director of Forest Products Research for the year 1935.**—*Rep. For. Prod. Res. Bd, Lond., 1935*, pp. 3–55, 6 pl., 5 graphs, 1936.

The following items are of phytopathological interest in this report [*R.A.M.*, xv, p. 185]. The Committee of the British Standards Institution has appointed a panel to examine the details of a standard laboratory test for determining the toxicity of wood preservatives in the laboratory to be based on the standard test agreed to by the International Conference held in Berlin in 1930 [cf. ibid., xv, p. 621]. During the examination of strains of fungi used in the tests at different laboratories it was observed that the strain *Fomes annosus* No. 517 of the Forest Products Laboratory, Madison, extensively used as a standard test fungus in the United States, is actually *Polyporus tulipiferus*.

In experiments made to determine the absorption of preservatives at various stages during the hot and cold open-tank process [ibid., xv, p. 695], it was ascertained that if the charge is heated a second time (i.e., after one cooling) a quantity of the absorbed liquid is expelled, so that if the timber is removed at this stage a considerable economy in preservative is effected, amounting in the case of absorbent timber, such as Scots pine [*Pinus sylvestris*] sapwood, to as much as 50 per cent. of absorbed creosote.

Field tests of natural durability showed that the following are not durable under exposed conditions: beech, sycamore [*Acer pseudoplatanus*], London plane [*Platanus*], hornbeam [*Carpinus betulus*], elm, willow, ash, the sapwood of Scots, maritime [*Pinus pinaster*], and

Corsican [*P. laricio*] pines, silver fir [*Abies alba*], and hemlock [*Tsuga* sp.]. Laboratory tests demonstrated that *Mansonia* [*Achantia*] *altissima*, *Ocotea usambarensis*, *Sarcocephalus diderrichii*, and *Symphonia globulifera* possess high natural resistance to decay-producing fungi, and that *Sequoia sempervirens* is approximately as resistant as western red cedar [*Thuja plicata*].

In creosote impregnation tests of spruce a brown stain in some of the poles, associated with *Stereum sanguinolentum* [ibid., xvi, p. 146], appeared to be connected with a condition in the wood favouring absorption, and it is thought possible that the incipient decay produced by this fungus may be responsible for the high absorption occasionally obtained with this timber.

A field experiment with dipping treatments against stains and moulds on timber [loc. cit.] showed that under severe test conditions weak antiseptics, such as 5 per cent. sodium carbonate or sodium bicarbonate, had very little effect. A fair measure of control was given by certain proprietary antiseptics, but even with these it was essential to stack the timber so that rapid drying was facilitated. Experimental evidence was obtained that the development of internal stain in sycamore is probably generally due to chemical change in the cell contents, and not to the growth of staining fungi in the wood. These changes appear to take place wherever the timber is not freely exposed to the air.

In tests with proprietary anti-fungus paints [loc. cit.] none was found to be absolutely immune from all types of mould, though some were very much more resistant than ordinary white lead paint.

Lutz (L.). **Méthodes permettant de déterminer la résistivité des bois bruts ou immunisés soumis à l'attaque par les champignons lignicoles.** [Methods of determining the resistance of untreated and treated timber to attack by wood-inhabiting fungi.]—*Ann. Éc. Eaux For. Nancy*, v, 3, pp. 317–330, 2 figs., 1935. [English and German summaries. Received January, 1937.]

To determine the 'dysgenesic' [? inhibitory] power of wood preservatives the author's method is to culture any suitable fungus on Lutz's medium plus the preservative in increasing proportion and note the concentrations at which the fungus develops.

To ascertain the toxic dose of the antiseptic fragments of mycelium of the fungus are placed in tubes containing the preservative and water at concentrations ranging from the dysgenesic dose upwards and for periods varying from three hours to five days, and then cultured, after washing, on a nutrient medium. The concentrations permitting growth are then noted.

To determine the ability of treated and untreated wood to resist fungal attack the following procedure is adopted. Small blocks of untreated wood 1 by 1 by 5 cm. are soaked in water for 30 minutes, then placed on a potato slice in a culture and sterilized. Other cubes are placed in 250 c.c. water and heated to 110° C. for 10 minutes, after which they are transferred to a potato tube. The process is repeated up to 10 times, a number of pieces being set aside for testing at each washing. Parallel series are made with pieces of wood treated with preservatives. The selected fungi are introduced into each series so

prepared and the tubes kept at 20° for one month. A note is then made of the cubes which show fungal growth.

The rapidity with which the fungus destroys the wood is ascertained by submitting blocks of wood after exposure to infection for varying intervals to crushing tests and the results obtained are compared, by means of graphs, with those from any chosen wood as standard.

To determine the degree of penetration of a preservative a piece of wood measuring 25 by 22 by 7 cm. is treated with the preservative and left to dry. Test cubes, 1 cm. in each dimension, are then prepared in regular sequence and numbered according to the position occupied in the original piece of wood. Each cube is placed in a test tube, 1 c.c. of distilled water is added, and after sterilization at 120° is then inoculated, and kept at 20° for one month. Note is then made of those which show fungal growth, and a diagram made showing the cubes sufficiently and insufficiently protected by the preservative.

MONTGOMERY (H. B. S.). **An investigation of the temperatures lethal to some wood-decaying fungi.**—*Trans. Brit. mycol. Soc.*, xx, 3–4, pp. 293–298, 1936.

In order to obtain accurate data on the time required at certain temperatures to kill wood-decaying fungi, cultural experiments were carried out with 12 species on malt agar or small blocks of ash [*Fraxinus*: *R.A.M.*, xvi, p. 141] and Scots pine [*Pinus sylvestris*]. The one-month-old malt agar slant cultures were immersed in water maintained at the desired temperature and the tubes removed at regular intervals. From these subcultures were made and the growth noted after one month. Using the data obtained as a guide, tests were then made with the wood cultures kept moist in a glass dish for periods of over three weeks and up to two months. The blocks were placed each in a specially made water-tight rubber bag, tightly tied, and submerged in water kept at the desired temperature. One block was removed at the end of each time period, cooled, and subcultures made for determining viability.

A close correlation was observed between the results obtained on agar and on wood blocks. On both *Merulius lacrymans* was killed by 15 minutes' exposure to 40° C., *Poria vaporaria*, *Lenzites abietina*, *Pholiota adiposa* [ibid., xv, p. 68], and *Polyporus hispidus* [ibid., xv, p. 330] by 15 minutes at 55°, while *Lentinus lepideus* [ibid., xvi, p. 79], the most resistant of the fungi tested, was still living in agar cultures after 540 minutes at 60° and in wood block cultures after 30 minutes at 65°.

TOMPKINS (C. M.), TUCKER (C. M.), & GARDNER (M. W.). **Phytophthora root rot of Cauliflower.**—*J. agric. Res.*, liii, 9, pp. 685–692, 1 pl., 2 figs., 1936.

This is a full report on the authors' investigations on the root rot, caused by *Phytophthora megasperma*, of the cauliflower in California, an abstract from which has already been noticed from another source [*R.A.M.*, xv, p. 188; xvi, p. 159]. In addition to the hosts already enumerated *P. megasperma* was also found on hybrid cineraria (*Senecio cruentus*): it was further experimentally shown to be able to attack

ripe tomato fruits and potato tubers, and also to cause a light brown, mealy type of decay in apple fruits.

Masslovski (A. D.). О стерилизации почвы в парниках и теплицах. (Предварительное сообщение.) [On soil disinfection in hot and cool greenhouses. (Preliminary report.)]—*Pl. Prot. Leningr.*, *1936*, 8, pp. 165–168, 1936.

The results of preliminary experiments carried out in greenhouses in Kharkoff [Ukraine] showed that black leg of cabbage (*Moniliopsis aderholdi*) [*R.A.M.*, xvi, p. 223] was reduced from 69·5 per cent. in the controls to an average of 3·15 per cent. in pots (each containing 4 kg. soil) to which 1 c.c. chlorpicrin [ibid., xv, p. 518] had been added. Further work is being carried on to determine the optimum dose and conditions under which the compound may be used.

Morotchkovski (S. F.). Бурая гниль корней Сахарной Свеклы, вызываемая грибом **Moniliopsis aderholdi Ruhl.** [Brown root rot of the Sugar Beet, caused by *Moniliopsis aderholdi* Ruhl.]—*Научные Зап. Сахарной Промышл., Агрон. Вып.* [*Sci. Notes Sugar Indus., Kieff, Agric. Bull.*] 2, pp. 93–101, 5 figs., 1936.

An account is given of an outbreak during the summer of 1935 of a root rot of sugar beet in two districts of the Chernigoff region [Ukraine] caused by *Moniliopsis aderholdi* [see preceding abstract], a fungus not recorded hitherto on beet in the field. In its general characters the rot was very similar to that due to *Rhizoctonia violacea* [*Helicobasidium purpureum*: ibid., xiv, p. 730], but was brown instead of red. The disease, which in some places killed from 5 to 6 per cent. of the plants, was mostly confined to low-lying soils liable to water-logging, and in one instance was found in soil that had been first broken to cultivation in 1935.

In giving a historical, taxonomic, and cultural account of *M. aderholdi*, the author states that he inclines to the retention of this name for the organism, which by some other workers is referred to *Rhizoctonia*, until its fertile stage has been established. In pure culture the fungus was shown to grow best in slightly acid media, and to give practically no growth at all at P_H 7·5. Investigations consequent on its discovery in the Chernigoff region evidenced that *M. aderholdi* is fairly widely distributed in several sugar beet-growing areas of the Ukraine, as well as in central and northern regions of the Soviet Union, where it is known to cause black leg of cabbage; it has also been recorded as causing a severe root rot of cotton in Russian Central Asia. All the evidence collected indicated that the chief source of infection is the soil, in which the fungus overwinters on various plant débris, but the organism was also isolated from sugar beet seed-clusters from diseased plants and it was experimentally shown that seedlings raised from such seed are severely attacked by the fungus.

With reference to control of the disease under field conditions, it is suggested that diseased plants should be rogued out during vegetation, and buried to a depth of at least 50 cm. Frequent tillage of affected fields, together with liming of acid soils and improved drainage might also be helpful. At harvest the diseased beets should be culled out and

sent as soon as possible to the sugar factories, and never stored together with sound roots.

ARTSCHWAGER (E.) & STARRETT (RUTH). **Histological and cytological changes in Sugar-Beet seedlings affected with curly top.**—*J. agric. Res.*, liii, 9, pp. 637–657, 13 pl., 1936.

A fully illustrated account is given of the authors' studies of the histological and cytological changes that occur in the tap- and lateral roots of sugar beet seedlings following infection with curly top virus [*R.A.M.*, xvi, p. 226]. Early primary disturbances in these organs, recognizable about three days after inoculation, were found to be limited to the pericycle and immature cambium derivatives. The affected cells and their nuclei hypertrophy; the latter may expand symmetrically, become irregular, or assume odd shapes. There was evidence of the existence of two distinct, but usually overlapping, phases in the pathological changes in the cells. The first or anabolic phase is marked by an increase in nucleolar material and chromatin, as well as by changes in the structure of the latter. With the onset of the second or katabolic phase, the nucleus begins to undergo irreversible changes, which are often characterized by dissolution phenomena in the nucleus and proteolysis in the cytoplasm, and the passage of nucleolar fragments and altered chromatin through the weakened or partially destroyed nuclear membrane into the cytoplasm. Later stages are marked either by mere quantitative reduction or by disorganization due to local or general proteolysis.

Cytoplasmic inclusions consisting of calcium oxalate and leucoplasts, which are normally present in healthy beet plants, were often found to be enormously increased in curly top beetroots; the latter, however, also contained cytoplasmic inclusions foreign to healthy cells, such as transitory nucleolar fragments and possibly greatly altered chromatin extrusions. Amorphous precipitates, greatly varying in their staining reaction, were also very common.

The anatomical changes induced by the curly top virus are the formation of hyperplastic cells, and of sieve-tube-like elements with plastids and slime bodies but without sieve plates. Bead-like protuberances of pseudo-callus appear on the walls of the sieve tubes, usually both on the lateral and cross walls, but occasionally only on the terminal walls. The cells of the supernumerary cambiums divide longitudinally and incomplete divisions are commonly observed.

CHAMBERLAIN (E. E.). **Pea mosaic. Host range and methods of transmission.**—*N.Z. J. Sci. Tech.*, xviii, 6, pp. 544–556, 8 figs., 1936.

Pea mosaic [*R.A.M.*, xv, p. 28; xvi, p. 83] is one of the commonest and most widely distributed virus diseases in New Zealand, where it attacks garden and field peas, broad beans [*Vicia faba*], red clover (*Trifolium pratense*), blue lupins [*Lupinus angustifolius*], and sweet peas.

On garden peas the first symptom is the appearance of light-coloured areas along the veins of the young leaves. This network mottling is later replaced by a more general type, in which the light areas often occur between the veins. Affected plants are stunted and pale, with

small, occasionally distorted, leaves; they flower later than healthy ones, and the pods are fewer, smaller, less well-filled, and later maturing than normal. The symptoms appear only on leaves that develop after infection has taken place. On sweet peas the characteristic symptom is leaf mottling. Stunting is slight, with little effect on the number of flowers produced, though these are streaked and pale. Under field conditions affected red clover plants are markedly stunted and pale, with dwarfed leaves.

The disease was transmitted by juice inoculations from garden peas to garden peas, blue lupins, white lupins (*L. albus*), *L. mutabilis*, and sweet peas; from broad beans to broad beans and garden peas; from blue lupins to blue lupins and garden peas; and from yellow lupins (*L. luteus*) to blue lupins. The incubation period was shortest in young, quickly growing plants, and longest on old, slowly growing plants.

Insect transmission was obtained with *Myzus persicae*, *Aphis rumicis*, and *Macrosiphum gei*, the first of which appeared to be a more efficient vector than *A. rumicis*. The incubation period varied from 5 to 24 days, according to the age, state, and growing conditions of the plant. In addition to the same hosts as those infected by juice inoculations the disease was also transmitted by insect agency to alsike (*T. hybridum*) and other clovers, black medick (*Medicago lupulina*), and *Melilotus officinalis*.

In a footnote it is stated that a mosaic of beans (*Phaseolus vulgaris*) occurs in New Zealand, but appears to be quite distinct from pea mosaic, since it could not be transmitted to peas, nor the pea mosaic to beans.

Townsend (G. R.) & Wedgworth (H. H.). **A manganese deficiency affecting Beans.**—*Bull. Fla agric. Exp. Sta.* 300, 23 pp., 6 figs., 1936.

For over ten years beans [*Phaseolus vulgaris*] growing in certain areas in Florida where the soils have become calcareous as a result of burning or the admixture of marl have shown symptoms of manganese deficiency. The first sign of the condition is a slight loss of the green colour in the trifoliate leaves, which show a faint mottling, the tissue near the veins remaining green longer than the parts between the veins. Growth is retarded, and the affected leaves remain small. The whole leaf blade generally turns a golden-yellow in a few days, but before the chlorosis is complete, small, necrotic brown spots appear, parallel to each side of the veins, and, by the time the leaf has become yellow, form rows of stipples extending to the leaf tips and margins. Later, the under surface appears to be cupped between the veins, and the upper surface of the same areas appears water-soaked and soon breaks up. New growth from the apical bud becomes progressively slower and the buds die. Each successive leaf is smaller and more chlorotic than the preceding one, and when the bud dies, all the leaves are brown and withered. Frequently there is secondary growth from the lateral buds, but defoliation sets in, and the stems die.

Experimental evidence showed that the disease can be prevented by acidifying the soil with sulphur, or by applying manganese sulphate with the fertilizer. The application of 25 lb. manganese sulphate per

acre increased the average yield of two crops of beans from 4·6 to 109·0 hampers, and one of 50 lb. per acre to 122·5 hampers. The best and most lasting results were given by mixtures of sulphur and manganese, 50 lb. manganese sulphate and 50 lb. sulphur per acre increasing the yield to 132·3 hampers. The amount of manganese found in leaves from plots receiving the last-named treatment was 113·3 p.p.m. compared with 24·4 p.p.m. for those treated with 50 lb. manganese sulphate alone, and 9·9 p.p.m. for the untreated controls. It is suggested that the use of 25 lb. manganese sulphate and 200 lb. sulphur per acre per year will maintain normal production on badly burned soil. Good results were also obtained with manganese sulphate sprays and dusts, less than one quarter of the amount of manganese required by a soil treatment giving an equally good result when used as a spray. Two applications of a solution containing 4 lb. manganese sulphate in 50 galls. water are considered sufficient in most cases.

MATZULEVITCH (B.). Методы анализа почвы на зараженность головней Лука. [Methods of soil analysis for the detection of infection with Onion smut.]—*Pl. Prot. Leningr.*, *1936*, 8, p. 174, 1936.

It was experimentally shown that the presence in soil of spores of onion smut [*Urocystis cepulae*: *R.A.M.*, xv, p. 464] may be conveniently detected by sowing onion seed in the laboratory in suspected soil, and keeping the pots at 18° to 20° C.; in contaminated soil typical smut lesions are easily observed in 16-day-old seedlings under the microscope, the percentage infection under laboratory conditions being closely comparable to that obtained in the open in the same soil. A more direct method consists in collecting a number of soil samples from the field, thoroughly mixing them to make an average sample, of which three lots of 1 gm. each are separately shaken for 10 minutes in 3 c.c. of distilled water, this process being repeated twice; the three washings of each lot are poured together, 3 c.c. benzene are added, the whole shaken for 3 to 5 minutes, and then centrifuged; the smut spores collect as a dark-coloured deposit between the water and benzene, and are counted under the microscope in ten drops removed from the deposit by means of a pipette. It was shown that percentage infection of onion seedlings in the examined soils increased in direct proportion to the number of spores counted under the microscope.

PALO (M. A.). **The Phomopsis disease of Eggplant and its control.**—*Philipp. J. Agric.*, vii, 3, pp. 289–315, 8 pl., 2 graphs, 1936.

Heavy damage was caused in Pampanga Province, Philippine Islands, in the autumn of 1935 by *Phomopsis vexans*, the agent of leaf spot, stem canker, and fruit rot of eggplants [*R.A.M.*, xvi, p. 44], which in a field of 7,000 plants killed 64 per cent. of the fruits and destroyed 10 and 20 per cent., respectively, of the first and second harvests in transit. In 1936 another severe outbreak of the disease occurred in Nueva Ecija.

Of the two spore types produced by the fungus, the elliptical pycnospores generally develop in culture and in nature under Philippine conditions, though the filiform stylospores may be formed on dead eggplant stems in the field.

In greenhouse inoculation tests *P. vexans* was more virulent on seedlings exposed to a very humid atmosphere for protracted periods, but damping-off symptoms were only observed on seedlings grown in infected soil. Pycnidia constantly developed on the affected portions of the stems and leaves. Similarly in the field, the damp, showery weather following inoculation conduced to serious infection, the first symptoms of which were detected ten days after the operation. Of the 32 inoculated plants, 29 (90 per cent.) died of the disease during the quarter from 15th January to 18th April, 1936. The spores are disseminated by splashing rain and strong winds, on the feet of insects, and through cultural operations. Good control was secured on diseased plants by six weekly applications of 4–4–50 Bordeaux mixture, five fortnightly treatments with which prevented the development of infection of healthy stands. Other sanitary measures recommended are the use of healthy seed, which should if necessary be soaked for ten minutes in 1 in 1,000 mercuric chloride, 1 in 300 formalin, or water heated to 55° C., or for 30 minutes in water at 50°, burning the plant refuse after harvest, and triennial crop rotation.

VERONA (O.) & PASINETTI (P.). **Su di un deperimento della Lactuca sativa L.** [On a wilt of *Lactuca sativa* L.]—*Boll. Ist. agr., Pisa*, xi, pp. 364–376, 1 pl., 2 figs., 1936.

During 1934 and 1935 Olandese and Trocadero lettuces planted out during October in damp, compact soil in the vicinity of Pisa were severely affected by a wilt which destroyed up to 95 per cent. of the crop. The leaves withered up after developing spots which enlarged and became confluent, and as a rule the tap-roots showed large, cylindrical cavities at the collar. No insect or fungus was present, but affected material showed the presence of five strains of bacteria [which are described]; these include forms resembling in cultural characters, but not definitely identical with, *Bacterium vitians* [*R.A.M.*, xiii, p. 139], *Bact. viridilividum*, or *Bact. marginale* [ibid., xiv, p. 16].

Syringe inoculations in the collar of healthy lettuces with *Bact. vitians* gave positive results, the rapid and complete wilt set up by this organism confirming its pathogenicity; a complete but slower wilt was caused by the authors' strain I 2, while slight infection was produced by the authors' strain I 1, *Bact. pyocyaneum* [*Bacillus pyocyaneus*] and *Bact.* [*B.*] *fluorescens-liquefaciens* [loc. cit.] which, it is considered, may have acted as weak parasites in lettuces injured by frost.

The disease is considered to be the same as that reported by Nellie A. Brown (*J. agric. Res.*, xiii, pp. 367–388, 1918) from South Carolina [as due to *Bact. vitians*].

NISIKADO (Y.) & MATSUMOTO (H.). **On the smut disease of Sagittaria trifolia L. var. sinensis Makino caused by Doassansiopsis horiana (P. Henn.).**—*Ber. Ōhara Inst.*, vii, 3, pp. 415–427, 5 pl., 1936.

Sagittaria trifolia var. *sinensis*, the tubers of which are stated to be widely used, especially in western Japan, as a substitute for rice, is liable to infection by a smut disease characterized by the development on the leaves of yellowish or orange-yellow, irregular, ill-defined lesions, 5 mm. or more in diameter, with blackish sori in the centre, usually

produced in the subepidermal spongy parenchyma, and on the petioles of short, dark stripes. The sori measure 72 to 180 μ in diameter and produce numerous promycelia, from the ends of which (20 to 100 μ in length) are abstricted crowns of 4 to 8 (usually 5 to 6) hyaline, fusiform, long-elliptical, or cylindrical sporidia, 25 to 40 by 4 to 6 μ. The morphological characters of the organism correspond to those of *Doassansia horiana* amd *D. tokinensis* P. Henn., but the writers are of opinion that it would be more correctly placed in the subgenus *Doassansiopsis*, and the *Sagittaria* smut is accordingly renamed *D. horiana* (P. Henn.) Nis. & Mats.

The most abundant mycelial growth and sporidial production were made on potato sucrose agar, followed by apricot and malt extract agars, the colonies being generally wet, pale greyish, yeast-like, devoid of aerial hyphae, and sometimes displaying centrifugally radiating grooves. The minimum, optimum, and maximum temperatures for the development of the mycelium and reproductive organs of *D. horiana* are 10°, 30°, and 35° to 37° C., respectively. Positive results were given by inoculation tests with the smut on young, wounded leaves of *S. trifolia* var. *sinensis*.

Rapports sommaires sur les travaux accomplis dans les laboratoires en 1934 et 1935. [Summary reports on laboratory work carried out in 1934 and 1935.]—*Ann. Epiphyt.*, N.S., ii, 3, pp. 381–422, 2 graphs, 1936.

These reports from the various agricultural research stations in France [cf. *R.A.M.*, xiii, p. 76] contain among many others the following items of interest, apart from those already noticed from other sources.

During 1934 and 1935 the Garnet, Ile-de-France, Providence, Ridit, and Warren wheat varieties grown at Versailles were resistant to *Puccinia glumarum* at all stages of their growth, and had less than 5 per cent. of leaf surface destroyed; the degree of susceptibility of a large number of other varieties is indicated.

In the south-west the rapid degeneration of certain selected seed potatoes is attributed to potato virus Y. Many potatoes, though rigorously selected, carry virus X in a latent form and inoculation of these with Y results in frisolée.

When a large number of Solanaceous hosts were experimentally inoculated with a virulent strain of *Bacterium tabacum*, no lesions appeared on *Nicotiana sanderae*, *N. affinis*, or *N. alata*, or on plants belonging to any genus other than *Nicotiana*. In Alsace the chief agents of damping-off in tobacco seed-beds are species of *Sclerotinia*, *Pythium*, and *Thielavia*. The best control was given by seed disinfection with formalin 0·5 per cent. for 45 minutes, and soil treatment with 5 per cent. formalin using 10 l. of solution per sq. m.

The dying-off of young buds of raspberries in the spring was caused by *Didymella applanata* [ibid., xv, p. 817] and a die-back of black currants and gooseberries by *Phomopsis ribis* (Magn.) Barth. [*Cytosporina ribis* Magn.: ibid., iii, p. 433].

Cylindrocarpon ehrenbergii, *Ascochyta pisi*, *Peronospora pisi* [ibid., xv, p. 194], and *Thielaviopsis basicola* [ibid., xv, p. 467] occurred in

experimental plots of peas at Sarcelles. Inoculations with five species of *Fusarium* on peas in tubes and pots gave positive results with *F. oxysporum* f. 8 [ibid., xiv, p. 613] and *F. orthoceras* var. *pisi* [ibid., xiv, p. 339].

A species of *Hainesia* and a *Pythium* obtained from wilted golf lawns were shown by artificial inoculations to be pathogenic to *Poa pratensis P. compressa, Agrostis stolonifera, A. dispar, Festuca rubra,* and *F. duriuscula.*

Van Poeteren (N.). **Verslag over de werkzaamheden van den Plantenziektenkundigen Dienst in het jaar 1935.** [Report on the work of the Phytopathological Service in the year 1935.]—*Versl. PlZiekt. Dienst Wageningen,* 83, 88 pp., 6 pl., 1936.

The following are among the many items of interest in this report, prepared on the usual lines [*R.A.M.*, xv, p. 73]. Samples of wheat attacked by *Septoria tritici* [ibid., xvi, p. 165] were received from various parts of Holland, but in no instance was the damage caused by the fungus appreciable.

A basal rot of asparagus stems, the interior of which showed a pink discoloration, was found to be due to *Fusarium culmorum* (identified by Wollenweber) [ibid., xiv, p. 735], the first record of the fungus on this host in Holland. The same authority identified the organism inducing a yellow discoloration and wilt of young red cabbages in the north as *F. conglutinans,* the agent of the disorder known as 'yellows' in the United States [ibid., xvi, p. 159]. A sample of spinach seed from the State Seed Testing Station was found to be heavily infected by the acervuli of *Colletotrichum spinaciae* [ibid., xv, p. 774], which was experimentally shown to cause a reduction of 44 per cent. in the stand.

A die-back of Gros Colman and Black Alicante vines, the latter less extensively affected, was found to be due to a *Phomopsis,* possibly the imperfect stage of *Cryptosporella viticola* [ibid., xi, p. 790], which apparently enters the stem by way of pruning wounds on the short, thick, lateral shoots. Vine leaves showing a mosaic-like spotting [ibid., xiii, p. 492] are occasionally submitted for examination.

P. mali, previously reported on apples [ibid., xv, p. 73], was observed on young espalier pears in 1935.

Oidium begoniae was found severely attacking begonia plants [ibid., xv, p. 443] at Wageningen; the leaves shrivelled, growth was arrested, and flowering abortive.

Both nursery and avenue trees of *Acer pseudoplatanus* and other *A.* spp. are liable to infection by *Nectria cinnabarina* [ibid., xvi, p. 217] which causes a serious die-back, especially of sycamores, and may even kill the trees. Effective control of the fungus was attained by spraying with 1·5 per cent. Bordeaux mixture, followed by disinfection of the lesions with carbolineum (10 per cent. in summer, 50 per cent. in winter), excision of infected tissue, treatment with carbolineum (5 per cent. in summer, 10 per cent. in winter), and when dry, with coal-tar, concluding with a final application of 1·5 per cent. Bordeaux mixture.

Keithia [*Didymascella*] *thujina* was responsible for a brown discoloration of *Thuja gigantea* [ibid., xv, p. 412], while *P. juniperovora*

caused the death of all but 10 or 15 per cent. of the junipers [ibid., xii, p. 251] imported from France to serve as stocks in grafting operations.

Notes are given on the spraying of fruit trees against diseases and pests and various other experimental activities, together with an alphabetical list of the disinfectants tested for different purposes, and the outcome of trials undertaken with them.

PEROTTI (R.). **Note fitopatologiche per gli anni 1933–35.** [Phytopathological notes for the years 1933–35.]—*Boll. Ist. agr., Pisa*, xii, pp. 233–255, 1 fig., 1 graph, 1936.

Notes are given on the fungous and bacterial diseases and insect pests attacking cereals, vegetables, fruit trees, olives, vines, and ornamentals during 1933 to 1935 in the part of Italy under the supervision of the Pisa Agricultural Institute.

SMITH (F. E. V.). **Report of the Government Microbiologist.**—*Rep. Dep. Sci. & Agric. Jamaica, 1935*, pp. 53–72, 1936.

During 1935, the total number of cases of Panama disease of bananas (*Fusarium oxysporum cubense*) reported in Jamaica reached 415,931 for all parishes excluding Portland, an increase of 56 per cent. on the total for 1934 [*R.A.M.*, xv, p. 343]. Land lost to banana cultivation is estimated at 32,000 acres, including large areas of the best alluvial land infected through the agency of flood water. The decision to permit one root treatment throughout the island was put into operation during the year.

Coco-nut bud rot due to *Phytophthora* [*palmivora*: ibid., xv, p. 343] occurred sporadically all over the island, as a result of the hurricanes experienced since 1932. Leaf disorders similar to those experienced in St. Mary [loc. cit.] have now arisen in St. Ann and Trelawny, and it is apparent that in areas where the rainfall or soil is unsuitable leaf troubles appear when the trees are upwards of 20 years old, and, unless growth can be aided by cultivation and drainage, may develop into 'pencil point' which renders the tree valueless and finally kills it.

Oleocellosis [ibid., xvi, p. 94] was very frequent in citrus fruits carelessly or tardily prepared for shipment. Stem-end rot (*Diplodia natalensis*) of citrus is now a minor problem. Knot disease (*Sphaeropsis tumefaciens*) [ibid., xii, p. 565] of lemons and limes was reported on several occasions from the north side of the island.

Pimento [*Pimenta officinalis*] rust (*Puccinia psidii*) [ibid., xv, p. 742] appeared throughout the island in 1935. The trees carry their leaves for two years, and when infection is severe defoliation of the young leaves (the only ones attacked) is caused. Both the 1934 and 1935 crops of leaves were almost entirely lost in the Manchester and St. Elizabeth area, leaving the trees practically leafless by May. Spraying is neither feasible nor economic, and the outlook for growers in the higher altitudes is unpromising.

In the section of this report dealing with cold storage investigations it is stated that Cavendish bananas [*Musa cavendishii*] shipped abroad or held in cold storage were commonly affected by stem-rot [ibid., xv, p. 451]. Experiments showed that expensive cultivation would be necessary to obtain good yields with this variety in Jamaica, and that

some protective covering would be necessary during shipment to prevent bruising. It is clear that the additional expenses involved render the Cavendish banana unprofitable to the average grower at present.

From the beginning of the experimental shipments of Jamaica Pairi mangoes in 1933 wastage has invariably occurred, reaching 33⅓ per cent. in some instances, and seldom falling below 20 per cent. Stem-end rot, generally caused by *Colletotrichum gloeosporioides*, was one cause of loss.

Annual Report of the Department of Agriculture, Zanzibar Protectorate, 1935.—45 pp., 1936.

The following items of phytopathological interest occur in this report. 'Sudden death' of cloves [*R.A.M.*, xv, p. 204] entails an annual loss estimated at 7·5 to 8·75 per cent. of the stands. 'Die-back' of cloves [ibid., iii, p. 79] would appear, from the results of a nutrition deficiencies trial, to be largely due to competition with plantation grass for phosphorus and potassium salts.

None of the cassava varieties from Java and East Africa used in test plots proved to be completely immune from mosaic [ibid., xv, p. 204; xvi, p 16], but two of the Javanese gave considerable promise in comparison with the local strains. Roguing increased the yield from 9,192 to 10,748 lb. per acre.

Plant pathology.—*Rep. Hawaii agric. Exp. Sta., 1936*, pp. 33–40, 1 fig., 1936.

It is stated in the introduction to this report that the department of plant pathology has been re-established under the direction of G. K. Parris after a lapse of 16 years. During the period under review research work was concentrated mainly on taro (*Colocasia esculenta*) and tomato diseases. Taro is subject to two major corm rots, one a mushy, malodorous type of decay ('soft rot') associated with an unidentified *Pythium* (probably the same as that mentioned by Carpenter in *Rep. Hawaii agric. Exp. Sta.*, 1917–18 and that recorded by Wright in the Gold Coast [*R.A.M.*, xi, p. 763]), and with *Phytophthora colocasiae* [ibid. xiv, p. 122; xvi, p. 232], frequently accompanied in a secondary capacity by *Bacillus carotovorus*. All attempts to reproduce the typical features of the rot as observed in the field gave negative results, and the development of the disease is believed to be due to the combined action of either or both the above-mentioned weakly parasitic Phycomycetes and unfavourable soil conditions. The second disorder, known as 'internal hard rot' or 'guava seed', transforms the vascular system of the corm into a hard, woody, yellowish- to dark brown mass, useless for culinary purposes. No pathogen has been detected in the diseased tissues and the possible virus or physiological nature of the disturbance is under consideration. *Sclerotium rolfsii* also occasionally attacks taro corms [ibid., xi, p. 763], chiefly in storage. Leaf spots are caused by *P. colocasiae* and *Phyllosticta colocasiae* [loc. cit.], both of which may be destructive in cool, damp, windy weather.

The principal fungous diseases of tomato are early blight (*Alternaria solani*) and the rot due to *Phoma destructiva* [ibid., xvi, p. 69], while

a *Fusarium* wilt is sometimes severe. Mosaic is prevalent in all parts, often causing a light set of fruit. The chief physiological disorder is blossom-end rot [ibid., xv, p. 690].

Among other diseases observed on the islands of Oahu and Kauai were leaf spot of asparagus (*Cercospora asparagi*) [ibid., ix, p. 613], bean (*Phaseolus vulgaris*) leaf spots (*Phoma subcircinata* and *Phytomonas* [*Bacterium*] *phaseoli* [ibid., xvi, p. 85]), *Septoria lycopersici* on egg-plant, heart rot of lettuce (*Bacterium vitians*) [see above, p. 297], die-back of mango (*Botryosphaeria ribis*) [ibid., ix, p. 344], leaf spot of pepper (*Capsicum frutescens*) due to *Bact. vesicatorium* [ibid., xv, p. 537], and *Fusarium* [*javanicum var.*] *radicicola* [ibid., xv, p. 765] on roselle (*Hibiscus sabdariffa*).

Burgwitz (G. K.). Бактериальные болезни растений. [Bacterial diseases of plants.]—339 pp., 8 figs., Издат. Акад. Наук СССР. [Publ. Off. Acad. Sci. USSR.], Leningrad, 1936.

This is a revised and somewhat amplified edition of the author's monograph on plant pathogenic bacteria [*R.A.M.*, xv, p. 4], incorporating work published up to the beginning of 1935. The following new combinations are made: *Bact. carotae* [ibid., xiv, p. 211], *Bact. cerasi* var. *prunicola* [ibid., xiii, p. 452], and *Bact. hypertrophicans* [ibid., xii, p. 435]. *Bact. ananas* Serrano 1934 [ibid., xiv, p. 456] is renamed *Bact. serranoi* to avoid [it is stated] any confusion with *Bact. ananas* (Serrano) Burgwitz 1935 (*Bacillus ananas* Serrano, 1928) [loc. cit.]. A number of species transferred to *Bacterium* in the earlier edition are reprinted as new combinations in this text, including *Bact. croci* [ibid., ii, p. 42], *Bact. gladioli*, *Bact. heteroceum* [ibid., x, p. 628], *Bact. itoana* [ibid., xi, p. 536], *Bact. mors-prunorum* [ibid., xi, p. 379], *Bact. papaveris* [ibid., vii, p. 243], *Bact. polycolor* [ibid., x, p. 133], *Bact. rubrisubalbicans* [ibid., x, p. 129], *Bact. saliciperda* [ibid., xii, p. 61], *Bact. tracheiphilum*, *Bact. utiformica* [ibid., xi, p. 379], *Bact. viridiflavum*, *Bact. v.* var. *concentricum* [ibid., xii, p. 348], *Bact. betivorum* [ibid., x, p. 575], *Bact. cacticidum* [ibid., iii, p. 706], *Bact. phytophthorum*, *Bact. berberidis* [ibid., xi, p. 109], *Bact. citrimaculans*, *Bact. mangiferae*, *Bact. viburni* [ibid., xi, p. 110], *Bact. prunicola* [ibid., xi, p. 58], *Bact. lycopersicum*, *Bact. sorghi*, *Bact. carotovorum*, and *Bact. agropyri*.

Stapp (C.). **Der Pflanzenkrebs und sein Erreger Pseudomonas tumefaciens. IV. Mitteilung: eine neue Wirtspflanze (Dahlia variabilis Desf.) mit hochvirulentem Erreger.** [Crown gall of plants and its causal organism *Pseudomonas tumefaciens*. Note IV: a new host plant (*Dahlia variabilis* Desf.) with a highly virulent agent.]—*Zbl. Bakt.*, Abt. 2, xcv, 13–17, pp. 273–283, 4 figs., 1936.

Continuing his studies on the crown gall of plants caused by *Pseudomonas* [*Bacterium*] *tumefaciens* [*R.A.M.*, xii, p. 680], the writer describes inoculation experiments with a strain of the organism from *Dahlia variabilis* [ibid., xv, p. 370], pure cultures of which on bouillon agar induced virulent infection not only on its own host (foliage and tubers) but also on *Pelargonium zonale* [ibid., xvi, p. 235] and Lucullus tomatoes. The wilting of the plants shortly after inoculation pointed to the

migration of the bacterium from the site of entry, a supposition that was confirmed by its detection after five weeks at a distance of 31 cm. from the place of insertion. Secondary tumours were formed as a result of reinoculation by means of sterile needles at a point widely removed from the original site of penetration. The dahlia strain of *Bact. tumefaciens* was shown by serological tests to be identical with that from *Chrysanthemum frutescens* II b.

BERTHELOT (A.) & AMOUREUX (GERMAINE). **Recherches sur la composition chimique des tumeurs de la Betterave déterminées par Bacillus tumefaciens.** [Studies on the chemical composition of the Beetroot tumours caused by *Bacillus tumefaciens*.]—*C.R. Soc. Biol., Paris*, cxxiii, 34, pp. 942–944, 1936.

There was found to be little difference in two consecutive years (1934 and 1935) between the content in dry matter of healthy beetroot (semi-sugar) tissues and those of tumours induced by inoculation with *Bacillus* [*Bacterium*] *tumefaciens* [*R.A.M.*, xvi, pp. 161, 235], the following values being obtained: healthy 11·75 and 9·47 per cent. in 1934 and 1935, respectively, tumours (hop strain) 12·50 and 9·46, and tumours (*Anthemis* strain) 12·75 and 9·46. The saccharose, glucose, and levulose contents of the fresh pulp of healthy tissues were 5·12, 0·08, and 0·44 per cent., respectively, compared with 4·80, 0·65, and 0·69 for the hop tumours and 7, 0·55, and 0·10 for those induced by inoculation with the *Anthemis* strain. The following values were obtained for the nitrogen, potassium, and phosphorus contents (per cent. of dry matter): healthy 1·969, 0·51, and 0·213, hop tumours 2·482, 0·49, and 0·226, and *Anthemis* tumours 2·417, 0·67, and 0·229. On exposure to Schiff's reagent the distillate from the tumours (both sources) assumed a vivid pink coloration, while illumination by Wood's rays induced a bluish-green fluorescence in the tumour extracts compared with the purplish-pink tint of healthy material.

BERTHELOT (A.) & AMOUREUX (GERMAINE). **Sur la teneur en glutathion et en acide ascorbique des tumeurs de la Betterave déterminées par Bacillus tumefaciens.** [On the glutathion and ascorbic acid content of the Beetroot tumours caused by *Bacillus tumefaciens*.] —*C.R. Soc. Biol., Paris*, cxxiii, 34, pp. 944–946. 1936.

The ascorbic acid content (per 100 c.c.) of the juice of healthy beetroot (semi-sugar) tissues was estimated at 0·028 gm. compared with 0·057 for that of the extract of tissues inoculated with the hop strain of *Bacillus* [*Bacterium*] *tumefaciens* [see preceding abstract], the corresponding figures for glutathion being 0·0006 and 0·0030 gm., respectively.

HANES (THEODORA B.). **Observations on the results of inoculating cereals with the spores of cereal rusts which do not usually cause their infection.**—*Trans. Brit. mycol. Soc.*, xx, 3–4, pp. 252–292, 18 figs., 1936.

In this study inoculation experiments [which are fully described] were carried out with the uredospores of *Puccinia triticina*, *P. glumarum tritici*, *P. anomala*, *P. coronata* [*P. lolii*], and *P. graminis secalis* on their

normal hosts and also on cereals on which they do not normally occur, and their development in the two sets of hosts compared. It was found that, in general, the relation of the host to the fungus which does not develop on it in nature is antagonistic, the mesophyll cells near the stomata of entry usually being killed. The invasion of the inappropriate hosts, however, proceeds normally at first. Exceptionally, the fungus kills the guard cells of the stomata of entry, but fails to develop further than the formation of substomatal vesicles, and the host displays no further antagonistic reaction.

P. triticina sometimes produced normal uredospore pustules on rye and occasionally minute, abortive pustules on barley. In oats, progress by *P. triticina* was negligible, and only once was a haustorium seen. *P. glumarum tritici* produced intercellular mycelia in rye and barley, but no pustules. It entered oats, but produced no mycelium. *P. anomala* initiated invasion of wheat, rye, and oats, killing the guard cells, but failing to form mycelia in the tissues. Germ-tubes of uredospores of *P. lolii* from oats entered wheat, barley, rye, *Lolium perenne*, and *L. italicum*, but usually failed to develop beyond the formation of infecting hyphae; the contiguous mesophyll cells were sometimes killed. The progress of infection by the aecidiospores of *P. lolii* from *Rhamnus catharticus* was negligible on oats, wheat, barley, and *Lolium* spp., and no uredospores were formed. The immunity of oats from the aecidiospores from *R. catharticus* indicates that this form has a host range outside the hosts experimented with. Rye plants inoculated with aecidiospores showed traces of an intercellular mycelium and haustoria, but there was an antagonistic reaction to the fungus. *P. graminis secalis* from rye and *Agropyron repens* invaded wheat, barley, and oats, and occasionally produced small uredospore pustules on barley and wheat but no development took place beyond the substomatal vesicles in oats. The fungus always formed its first haustorium in an epidermal cell adjacent to the stoma of entry.

Fischer (G. W.). **The longevity of smut spores in herbarium specimens.** —*Phytopathology*, xxvi, 12, pp. 1118–1127, 1936.

Out of 387 herbarium specimens of 77 species of smuts tested for spore longevity, 80 representing 24 species (11 originating in countries outside the United States) were found to contain viable spores [*R.A.M.*, xvi, p. 247]. The following species were remarkable for their longevity: *Tilletia tritici* [*T. caries*] (Washington) 18 years, *T. levis* [*T. foetens*] (Kansas) 25 [ibid., iii, p. 512], *Ustilago hordei* (Montana) 23, *U. avenae* (Washington and Rhine Province, Germany), 13 and 12, respectively, *Sphacelotheca sorghi* (Washington) 13, *U. bromivora* (Washington) 10 [ibid., xv, p. 445; xvi, p. 155], and *Entyloma dahliae* (Germany) 10 [ibid., xvi, p. 18]. The considerable differences in viability noted in various collections of the same age and species are believed to be correlated with the degree of maturity of the spores at the time of collection, as suggested by Miss Sampson [ibid., viii, p. 372]; in several instances collections of fully matured spores 12 to 18 years old showed higher germination percentages than much younger ones of the same species composed of imperfectly developed material. Generally speaking, the Tilletiaceae survived for longer periods than the Ustilaginaceae.

Christoff (A.). Твърдата главня по Пшеницата въ Шуменската область. [Bunt of Wheat in the Shumla region.]—*Publ. Min. Agric. and Crown Lands, Sofia, 1936*, 62, 21 pp., 1 map, 1 graph, 1936. [German summary.]

This is a very fully tabulated account of the author's mycological examination of 519 samples of wheat of the 1932 and 1933 harvests from 13 districts of the Shumla region in north-east Bulgaria. The results showed that 91·33 per cent. of the samples were attacked to a greater or lesser degree by *Tilletia levis* [*T. foetens*], and 47·06 by *T. tritici* [*T. caries*], both species being simultaneously present in 40·11 per cent. of the samples; only 0·79 per cent. were entirely free from bunt. *T. foetens* is distributed throughout the region, the severity of its incidence gradually declining from the east (Black Sea littoral), where it alone is present, to the west, where the predominating species is *T. caries*. The river Danube appears to form a barrier for the westward spread of *T. caries*, since this species is only occasionally reported in Rumania, where the prevailing wheat bunt is *T. foetens*. These results, taken in conjunction with the fact that local Bulgarian wheat varieties are severely attacked by *T. foetens* and only slightly or not at all by *T. caries*, are considered to suggest that while the former species is native to Bulgaria, the latter is a recent importation from abroad, most probably with the Noah variety.

Yu (T. F.), Hwang (L.), & Tsiang (C. T.). **Varietal resistance and susceptibility of Wheats to flag smut (Urocystis tritici Koern.) III. Physiologic specialization in Urocystis tritici Koern.**—*Bull. Chin. bot. Soc.*, ii, 2, pp. 111–113, 1936. [Chinese summary.]

Continuing their studies at Nanking, China, on the varietal reaction of wheat to flag smut (*Urocystis tritici*) [*R.A.M.*, xiii, p. 752; xvi, p. 159], which in 1936 attacked at least 90 per cent. of the crops in Siao Hsien, Kiangsu, and caused up to 94 per cent. infection in 37 localities of eight provinces, the writers tabulate and discuss the outcome of four years' inoculation tests with collections of the fungus from different parts of the country on ten wheat strains. On the basis of these trials five physiologic forms of *U. tritici* are differentiated. Nanking wheat No. 716 was resistant to forms 1, 2, and 3 but susceptible to 4 and 5, No. 799 resistant to 1 and 2 but susceptible to 3, No. 793 resistant to 1 but susceptible to 2 and 3, No. 795 resistant to 4 but susceptible to 5, No. 796 resistant to all forms, and No. 800 and H. 1102 susceptible to all.

Bussmann (B.). **Untersuchungen über die Virulenz von Ophiobolus graminis Sacc.** [Investigations on the virulence of *Ophiobolus graminis* Sacc.]—*Phytopath. Z.*, ix, 6, pp. 571–581, 5 figs., 1936.

The results of experiments with 21 strains of *Ophiobolus graminis* [*R.A.M.*, xvi, p. 29] isolated from diseased wheat plants from various localities in Germany in 1931, showed that they differed considerably from one another in cultural behaviour. In general the mycelium of *O. graminis* assumes a dark colour, but certain strains developed an immersed mycelium that remained hyaline throughout. Some strains

gave a thick, cottony, black aerial mycelium, while in others it was sparse and white to grey, and in one it was distributed over the whole surface of the culture medium in small, whitish-grey tufts. Most of the strains tested failed to fructify on agar media, but a large number of these gave perithecia on straw after a few months. The capacity to produce perithecia in pure culture is apparently a distinctive feature of certain strains. Some of the strains exhibited a strong tendency to form sporidia, even from young spores.

Soil inoculation experiments of wheat in pots showed that the various strains also differed widely from one another in pathogenicity, but not in their ability to form perithecia on the host, these fructifications appearing within a comparatively short time on all plants with foot lesions. Comparative tests of strains propagated vegetatively from mycelium with others obtained from perithecia showed that the former were more virulent in five cases, the latter in two, while both were equally virulent in six. The addition of perithecia to the soil inoculum did not increase the pathogenicity of the strains, and the purely vegetative subculturing of three strains for a year did not reduce their virulence, which was maintained both in the light and in darkness. From a practical standpoint these investigations are considered to indicate that the destruction of wheat stubble bearing the perithecia of the fungus is not a sound measure in the control of the disease.

GARRETT (S. D.). **Soil conditions and the take-all disease of Wheat.**—*Ann. appl. Biol.*, xxiii, 4, pp. 667–699, 1936.

Continuing his studies on wheat take-all (*Ophiobolus graminis*) [*R.A.M.*, xiii, p. 433] the author found that the organism was unable to grow through the soil or to show any activity therein except along the roots of its hosts, and was only able to spread by root contact [ibid., xiv, p. 623]. This suggests that two alternating phases must be distinguished in the life of *O. graminis* in the soil, namely, a parasitic or ascendant phase and a saprophytic or declining one; during the latter the fungus is exposed to the competition of secondary organisms which enter the wheat roots already killed in a regular succession of secondary parasites followed by saprophytes. It was experimentally shown that in the parasitic phase the rate of spread of the fungus varies widely with the soil conditions, moisture, temperature, aeration, reaction, and the like, and that its growth may even be entirely inhibited, in which case infection is non-progressive since it has been found that the fungus extends only for a few millimetres inside the roots if its external growth is stopped. The best growth along the wheat roots occurred in sand (53 mm. after 14 to 16 days at 20° C., as against 5 mm. in Slough soil), and in soil the growth was improved by any condition tending to promote better aeration, by raising the P_H value of the soil, and by steaming, except in the case of the more acid soils. A similar improvement in the soil was also brought about by formaldehyde. In the saprophytic phase, the disappearance of *O. graminis* from the soil appears to be due rather to the actual decomposition of its mycelium by saprophytic bacteria and fungi than to the absence in the soil of its host plants.

On the basis of these findings a hypothesis is suggested that in the

parasitic phase the rate of growth of *O. graminis* along the host root is related to the concentration of carbon dioxide in the soil immediately surrounding the root. In that region carbon dioxide accumulates from the respiration of the root, the hyphae of *O. graminis*, and of the soil microflora, and its dispersion will depend both on the physical nature of the soil, being more rapid in light and open soils, and on the reaction of the soil, since alkaline soils can act chemically as carbon dioxide acceptors.

In discussing control measures, it is pointed out that *O. graminis* grows on the host roots most rapidly under those soil conditions known to favour the occurrence of take-all in the field, namely, loose and open soils, soils of light texture, and alkaline soils; the controlling effect of the adverse conditions is thus considered to be exerted on the parasite itself, rather than to affect the resistance, yet to be demonstrated, of the hosts. Control, therefore, may be assisted by measures tending to compact the soil, to reduce the open character of the more sandy soils, e.g., by increasing the humus content, to lower the P_H value of the soils, and to increase the activity of the antagonistic soil microflora, e.g., by the incorporation of readily decomposable organic matter in the soil.

Adam (D. B.) & Colquhoun (T. T.). **The spread of take-all through the soil.**—*J. Aust. Inst. agric. Sci.*, ii, 4, pp. 172–174, 1936.

In an experiment carried out at the Waite Institute, South Australia, in 1935, plots were prepared by replacing the surface soil to a depth of 10 in. with river sand, in one case sterilized by heating, or with the original soil sterilized. Pure culture inoculum of *Ophiobolus graminis* was introduced into the middle of the plots and covered lightly, and disinfected wheat was planted immediately above. Two weeks later other rows were planted at distances of 2, 4, 8 and 12 in., the distances between the seeds within the rows being the same as between the rows.

Examination of the mature plants showed that maximum spread in the plots with 12 and 8 in. spacing was 0 and 8 in., respectively, as against 16 and 20 in. in two plots with 4 in. spacing, and 20 in. in that with 2 in. spacing. It is evident, therefore, that the presence of living wheat roots exerts an influence on the spread of *O. graminis* through the soil [see preceding abstract].

Machacek (J. E.) & Greaney (F. J.). **Studies on the control of root-rot diseases of cereals. IV. Influence of mechanical seed injury on infection by Fusarium culmorum in Wheat.**—*Canad. J. Res.*, xiv, Sect. C, 12 pp., 438–444, 1936.

Field experiments during 1932 to 1934 are recorded in which uninjured, lightly scarified, and heavily scarified Mindum and Marquis wheat seed was sown in plots artificially infected in one half with *Fusarium culmorum*. Severe root rot was successfully induced by applying mycelium and spores of *F. culmorum* to the seed and soil, and every year root rot was appreciably and significantly increased by soil inoculation. In 1933 and 1934 the difference in yield between the inoculated and uninoculated plots amounted to over 12 bush. per acre.

In all the experiments the detrimental effects of planting injured seed in soil infected with *F. culmorum* were established with a high

degree of significance. In 1932, the infected plots planted with injured seed gave 3·7 bush. per acre less than the infected plots sown with uninjured seed. In 1933, the use of severely injured seed resulted in a loss of 7·7 bush. per acre, the figure in 1934 reaching 9·1 bush. With both varieties and in all the experiments the amount of disease was increased and the yield decreased by increasing the amount of injury.

The results suggest that the large annual losses in yield caused by cereal root rots in Western Canada may be substantially reduced by sowing clean, vigorous, sound seed.

MACHACEK (J. E.). **Preliminary investigations on the effect of excessive soil salinity on the incidence of cereal root rots.**—*Sci. Agric.*, xvii, 4, pp. 215–224, 1936. [French summary.]

The author states that unusually severe attacks of root rot, caused by species of *Fusarium* and *Helminthosporium*, in 1934 and 1935 in definite areas in fields of wheat and other cereals in Manitoba were in every case found to have occurred on soils with a high concentration of soluble salts. Such areas were characterized by thinness of stand, dwarfing of the plants, absence of normal tillering, foot lesions, and early wilting and reddish-brown discoloration of the basal leaves. Magnesium sulphate is abundant in these soils and in pure culture on potato-dextrose agar *Fusarium culmorum*, *Helminthosporium sativum*, and *Pythium arrhenomanes* var. *canadensis* [*R.A.M.*, xv, p. 432] exhibited a high tolerance to concentrations of this substance ranging from 0·4 to 10 per cent., whereas barley seeds failed to germinate at concentrations of above 5 per cent., and wheat seed at concentrations higher than 3 per cent. In experiments in which barley was sown in a very saline soil (6·71 per cent. total soluble salts) and in the same soil after leaching, the former plants yielded a lower green weight than the latter, and the addition of magnesium sulphate to the leached soil caused a reduction in the green weight of barley and wheat plants, directly proportional to the amount of the salt added. In leached soil with seeds infected with *F. culmorum*, it was found that wheat (Mindum) was more susceptible to foot rot than barley, but the amount of foot rot in barley increased with the amount of magnesium sulphate added, an effect which was not observed in wheat. Lastly, in sand cultures of Mindum wheat, Victory oats, and Wisconsin Selection No. 38 barley, it was shown that high concentrations of magnesium sulphate retarded seedling growth and increased the disease rating in the seedlings produced by seeds artificially infected with *F. culmorum*. Seed germination was not seriously affected by the salt at any of the concentrations used.

CHRISTENSEN (J. J.). **Associations of microorganisms in relation to seedling injury arising from infected seed.**—*Phytopathology*, xxvi, 12, pp. 1091–1105, 1 fig., 1936.

A tabulated account is given of studies carried out at the Minnesota Agricultural Experiment Station to determine the effect of the association of a number of soil fungi, including *Trichoderma lignorum* [*R.A.M.*, xvi, p. 268], on the development of seedling blight and root rot of Minsturdi, Glabron, Manchuria, Peatland, and Wisconsin No. 38 barley

(*Fusarium* and *Helminthosporium* spp., chiefly *F. culmorum* and *H. sativum*) [ibid., xiv, p. 503].

Four methods of inoculation were used: (1) dipping or soaking the seed in a suspension of spores and mycelial fragments or extracts of the organisms, (2) pouring the suspension over the seed in the soil, (3) adding the cultures to the soil before or at the time of planting, and (4) dusting the seed with spores and mycelial fragments. The diseased seed was mostly obtained by spraying barley plants under muslin tents with various fungi, chiefly *F.* and *H.* spp.

The results of these trials do not indicate the exertion of any powerful action of the soil microflora on the disease under observation, no differences being detected in germination or extent of seedling injury when naturally infected barley seed was planted in sterilized or non-sterilized soil. Moreover, the addition of *T. lignorum* and several other fungi and bacteria to naturally infected barley seed or to sterilized or non-sterilized soil did not inhibit or retard the attacks of seed-borne parasites, while negative results also followed the immersion of infected seed in an extract of the soil organisms. However, the addition of *T. lignorum* and certain other organisms, including *Basisporium gallarum* [*Nigrospora* sp.], *Cephalothecium* [*Trichothecium*] *roseum*, *Chaetomium spirochaete*, and a bacterium, to seed or sterilized soil artificially inoculated with *H. sativum* increased the stand, diminished the number of stunted plants, and suppressed seedling injury, *C. spirochaete* and the bacterium being particularly effective in this respect. Apparently the antibiotic organisms have little or no effect on *H. sativum* and other fungi within the seed coat or seedling but are able to exert an antibiotic effect on *H. sativum* on the seed or in the soil.

It is concluded that naturally infected barley seed is one of the primary sources of seedling injury in Minnesota and should be treated with ceresan (2 oz. per bush.) before sowing to improve the stand, decrease seedling blight, and enhance plant vigour. Preliminary tests with new improved ceresan [ibid., xvi, p. 158] also gave promising results.

Aamodt (O. S.) & Platt (A. W.). **Varietal testing for the reaction of Oats to diseases, especially covered smut.**—*Canad. J. Res.*, xiv, Sect. C, 12, pp. 425–437, 1936.

As a prerequisite to breeding work varietal resistance trials were carried out in Alberta on 61 oat varieties in replicated plots for two years and 13 of the more promising varieties for a third year with a composite inoculum of *Ustilago levis* [*U. kolleri*]. The results obtained [which are tabulated and discussed] showed that the disease reactions ranged from high susceptibility (93·5 per cent. for dehulled New Era in 1934) to apparent immunity. Dehulling before inoculation increased infection approximately six times independently of the year in which the test took place, such increase being relatively greater in susceptible than resistant varieties. Throughout the tests no smut appeared on the following varieties whether dehulled or not: Markton [*R.A.M.*, xvi, p. 92], O.A.C. 144, Aurora, Awnless Monarch, Black Diamond, Black Mesdag, Cornellian, Early Ripe, Frazier, Nortex, Teck, Black Algerian, Burt, Cassel, Red Algerian, and Red Rustproof.

Marked differences were noted in varietal susceptibility to natural infection by halo blight (*Pseudomonas* [*Bacterium*] *coronafaciens*) [*R.A.M.*, xiii, pp. 156, 365] and blast (cause unknown) [ibid., xv, p. 355], the figures for the former (average of 1930 and 1931) ranging from 0·5 per cent. for Black Algerian and Red Rustproof to 25 per cent. for Victory, while those for the latter (1929 only) ranged from 0·3 per cent. in the case of Awnless Rustproof to 34·5 per cent. in that of Ferguson Navarro.

HOPPE (P. E.) & HOLBERT (J. R.). **Relative prevalence of various ear rot fungi in the 1933, 1934, and 1935 Corn crops.**—*Plant Dis. Reptr*, xx, 20, pp. 312–316, 1 graph, 1936. [Mimeographed.]

A comparison of the results of a survey of maize ear rot fungi present in samples of grain of the 1935 crop taken from carloads at terminal markets in the United States [*R.A.M.*, xiv, p. 437] with those of the two previous years' surveys showed very marked regional differences in the distribution of the fungi in given years, and equally striking differences for given regions in different years. For example, in Indiana the incidence during the three years of *Diplodia zeae* averaged 62, 21, and 4·6 per cent. and of *Fusarium* spp. (chiefly *F. moniliforme* [*Gibberella moniliformis*]) 8, 46, and 15·3 per cent., respectively. These very marked yearly fluctuations show the important effect of environment on the development of maize ear rots. The large increase in *Fusarium* spp. in 1934 as compared with 1933 was partly attributable to worm injury to the ears, *Fusarium* infection very frequently following this trouble. Owing to late planting and early frosts the 1935 crop failed generally to reach maturity, and this condition favoured infection by *Basisporium gallarum* [*Nigrospora* sp.], which greatly increased. The large increases for *G. saubinetii* in 1935 are of interest in view of an unusually heavy and widespread perithecial development of the fungus noted in the same year.

UPPAL (B. N.), KOLHATKAR (K. G.), & PATEL (M. K.). **Blight and hollow stem of Sorghum.**—*Indian J. agric. Sci.*, vi, 6, pp. 1323–1334, 4 pl., 1 graph, 1936.

In 1930 sorghum in many fields in Gujarat showed signs of early maturity and on splitting open the stalks the pith and fibres were found to be studded with sclerotial bodies of *Macrophomina phaseoli* [*R.A.M.*, xv, p. 648], not reported hitherto on this host. The following year the fungus was responsible for an epidemic seedling blight of sorghum in the East Deccan. The fungus was observed to enter the plant through feeding roots and to ascend the stem for considerable distances, even to the ear-head. No outward symptoms appeared until maturity approached, when infected plants had hollow stems, and produced a characteristic sound when shaken by the wind.

The fungus was readily and consistently isolated from diseased material and one strain from Mohol, East Deccan, produced pycnidia on sorghum seedlings in Roux tubes, with pycnospores 10 to 24 by 6 to 10 μ. The sclerotial stage measured 130 μ and 110 μ for two strains and the fungus therefore falls into Haigh's group C. In inocula-

tion experiments 6 out of 20 sorghum seedlings grown in inoculated soil showed root infection and brown discoloration at the collar, the fungus being re-isolated in pure culture. Infection was also secured on sorghum plants grown in Knop's solution in Roux tubes.

Experimental evidence demonstrated that the optimum soil temperature for infection was 35·5°C., while no disease developed at 30° or below, or at 40°. Seedling blight occurred at 35·5° and 37·5°, but was uncommon at 33°. High soil moisture was favourable to infection, the fungus becoming completely inactive when the water-holding capacity fell to 50 per cent. or under. These results confirm the general experience that the disease follows periods of heavy rain and high temperature. It is more common in clay soils than silt loams. The paper concludes with a detailed description of the cultural characters of the fungus.

NATTRASS (R. M.). **Citrus wastage trials, 1936.**—*Cyprus agric. J.*, xxxi, 2, pp. 52–56, 1936.

In a small test carried out in Cyprus, citrus fruit picked and handled with great care showed only 1·6 per cent. wastage [chiefly *Penicillium italicum* and *P. digitatum*: *R.A.M.*, xv, p. 291] 30 days after picking, as compared with 8·5 per cent. in the control lots picked and handled in the usual way.

In a further trial to check contact wastage in transit [loc. cit.] oranges were (*a*) dispatched to Covent Garden and (*b*) kept in storage locally for 25 days after being wrapped in ordinary wrappers containing 0·0127 gm. of iodine, dipped for approximately half a minute in 1 per cent. shirlan H.B. solution, enclosed in cellophane wrappers, or packed with a sheet of grease-proof paper between each two layers. The consignment to London showed on arrival 3·91, 3·84, 15, and 18·1 per cent. wastage for the four treatments, respectively, the wastage on 477 untreated cases of the consignment amounting to 8·37 per cent. In the locally stored fruit the percentage wastage given by the iodized wrappers, shirlan, and cellophane wrappers was, respectively, 2·8, 2·4, and 12·8 per cent., as against 7·6 per cent. in the controls, these figures agreeing closely with those obtained in London.

A larger trial was then made in which the fruits were dipped in 1 per cent. shirlan water-soluble powder with 0·25 per cent. agral added, or enclosed in wrappers containing approximately 0·015 gm. iodine. On arrival in London the wastage given by these treatments was 0·44 and 0·61 per cent., respectively, as against 2·53 per cent. in the controls. The selling qualities of the fruit were unaffected by the treatments. In the consignment stored locally, the same treatments gave 0·38 and 1·5 per cent. wastage, as against 4·1 per cent. in the controls, while another lot of fruit enclosed in iodized cellophane wrappers and similarly stored showed no wastage, as against 2·5 per cent. in the controls. The improved results given by shirlan as compared with those of the previous trial are attributed to improved methods of dipping and the incorporation of the wetting agent. From these trials it appears that until refrigerated ships and precooling plants are available a shirlan dip may be recommended to prevent the heavy losses that at present occur during shipment.

BAKER (R. E. D.). **Notes on Trinidad fungi. I. Phytophthora.**—*Trop. Agriculture, Trin.*, xiii, 12, pp. 330–332, 4 figs., 1936.

In these notes on species of *Phytophthora* (identified by S. F. Ashby) on citrus and cacao in Trinidad it is stated that the form of *P. palmivora* attacking citrus [*R.A.M.*, xvi, p. 169] very rarely causes gummosis but is found fairly regularly producing a fruit rot of grapefruit. Nearly all the citrus gummosis found locally is due to *P. parasitica*, which was also isolated from citrus and cotton seedlings affected by damping-off. An allied form from black shank tobacco may be *P. parasitica* var. *nicotianae*.

A *Phytophthora* strain of the *P. arecae-meadii* group, 'strain C', was obtained on several occasions from cacao pods in the course of studies made to determine the true cause of cacao black pod. Out of 663 diseased pods examined 356 were infected by the typical cacao strain of *P. palmivora*, 22 by strain C, and the remainder by *Botryodiplodia theobromae* (32), *Dothiorella* [*Botryosphaeria*] *ribis* (121), *Ceratostomella fimbriata* (14), *Colletotrichum gloeosporioides* (31), and unidentified species of *Colletotrichum*, *Phomopsis*, and *Fusarium*. The collective damage wrought by the other fungi is insignificant in comparison with that caused by *P. palmivora*. The strain C sporangia are produced sympodially as in *P. palmivora*, but differ from those of the latter fungus in that they are formed on much longer pedicels and have a much greater length to breadth ratio; the zoospores also remain motile much longer (at least an hour at 22° C.) than those of *P. palmivora*. Inoculations showed that the strain C zoospores can infect unwounded cacao pods.

FAWCETT (H. S.) & KLOTZ (L. J.). **Protection of Citrus fruits and foliage from brown rot.**—*Calif. Citrogr.*, xxii, 2, pp. 64–65, 1 fig., 1936.

Recent investigations are stated to have shown that citrus brown rot in California [*R.A.M.*, xv, pp. 89, 482] may be caused by at least four species of *Phytophthora*, viz., *P. citrophthora*, *P. parasitica*, *P. hibernalis* [ibid., xvi, p. 169], and *P. syringae* [ibid., xiv, pp. 264, 637].

Preventive treatment in the orchard (if cyanide fumigation is not used until after a normal rainy season or, better, after two rainy seasons) consists in spraying the ground and the branches up to a distance of 3 ft. with Bordeaux mixture 6–6–100 or a commercial copper sulphate and lime mixture with an equivalent strength of copper. If cyanide fumigation is effected a substitute formula is 12 lb. zinc sulphate, 1 lb. copper sulphate, and 6 lb. hydrated lime per 100 galls. water. Dusting the lower part of the tree with dry Bordeaux powder between October and December has also given promising results.

To prevent spread in the packing house any one of the following washing treatments may be used: (1) in water at 115° F. or over for at least 2 minutes, (2) sodium carbonate (soda ash) or trisodium phosphate (1¼ per cent.) for 2 to 4 minutes, or (3) copper sulphate (1½ lb. per 1,000 galls. water) for 2 to 4 minutes.

RUGGIERI (G.). **Esperienza sull' autogamia del Limone.** [Experiments on the autogamy of the Lemon.]—*Nuovi Ann. Agric., Roma,* xvi, 4, pp. 318–320, 1936.

Experimental evidence is adduced showing that the Monachello lemon, a variety resistant to mal secco (*Deuterophoma tracheiphila*) [*R.A.M.*, xiv, p. 680] is self-fertile and that the Interdonato variety [ibid., xv, p. 360] only yielded seedless fruit on selfing.

BARTHOLOMEW (E. T.). **Endoxerosis of Lemon fruits as affected by the application of different amounts of irrigation water.**—*Phytopathology,* xxvi, 12, pp. 1149–1154, 1936.

In a study at Riverside, California, on the relation of the moisture content of the soil to the incidence of endoxerosis (internal decline) of lemons [*R.A.M.*, xiv, p. 520], three groups of four Eureka trees each were grown in tanks with a moisture equivalent of 11 per cent. and a wilting point of 3·5 to 4 per cent. During the first stage of the experiment (January, 1929, to May, 1931) all the trees were given like amounts of water, while subsequently (June, 1931, to December, 1934) they were not irrigated until the soil in the tanks had attained a moisture content of 6 to 8, 5 to 6, and 4 to 5 per cent. in groups (1), (2), and (3), respectively, when sufficient water was applied to bring the entire mass up to 11 per cent., i.e., 47,677 galls. in all in group (1), 44,920 in (2), and 38,545 in (3). The trees in group (3), receiving the fewest irrigations and the smallest quantity of water, produced the maximum output of endoxerotic fruit, while those of group (2) bore the largest number of healthy lemons. The results of these tests confirm those of earlier trials [ibid., viii, p. 169] as to the importance of the withdrawal of water from the fruits during very hot, dry periods in the development of endoxerosis.

HAAS (A. R. C.). **Deficiency chloroses in Citrus.**—*Soil Sci.*, xlii, 6, pp. 435–443, 3 pl., 1936.

A study was made of the chloroses induced in citrus trees in sand, soil, and solution cultures by a deficiency of manganese, sulphate, and magnesium. Manganese deficiency in Valencia oranges was accompanied by a chlorotic foliar spotting which is common in the field in California where the calcium carbonate supply is excessive. A shortage of sulphate results in a gradual yellowing of the leaves, the veins remaining green until the last phase is reached. Magnesium deficiency is first manifested by a yellow stripe on either side of the dark green midrib, followed by general bronzing. A knowledge acquired in the laboratory of the symptoms corresponding to certain mineral deficiencies has been found helpful in the diagnosis of physiological disorders in the field [cf. *R.A.M.*, xvi, p. 170].

HAAS (A. R. C.). **The growth of Citrus in relation to potassium.**—*Calif. Citrogr.*, xxii, 1, pp. 6, 17; 2, pp. 54, 62, 14 figs., 1936.

When budded Valencia oranges were grown experimentally in sand cultures deficient in potassium the mature leaves became scorched, gum exudation commonly occurred from the leaves and trunks, many twigs died, and most of the fruits were lost before they reached maturity. The leaves showed resinous spots on both surfaces, similar leaves

occasionally being noted in the field. Grapefruit trees behaved like the Valencia orange, while lemon trees developed a yellowish or bronze discoloration on parts of many of the leaves and, as the new growth started, some of the mature leaves became burnt or scorched at or near the tip. The formation of gum deposits was observed on and within the leaves and in the cambium and phloem regions of the bark. Normal growth of lemon cuttings took place in potassium concentrations above 0·75 parts per million.

BLISS (D. E.). **Rhizosis, a recently discovered disease of Date Palms.**—*Thirteenth Ann. Rep. Date Grs' Inst., 1936*, pp. 4–6, 1936.

Between 1933 and 1935 the author examined 21 date palms in ten different gardens in California affected by a new root disease, termed 'rhizosis'. The first symptom is usually the death of the oldest leaves. The pinnae turn brown at the tip, necrosis progressing rapidly towards the trunk. The fruit stalks wilt, and many fruits may fall from the strands, while others are shrivelled or stunted. A characteristic symptom that occurs after many of the older leaves have died is the death of the youngest leaves in the crown. When all the leaves are dead the trunk bends slowly to one side as decay descends from the terminal bud.

Dissection of a Deglet Noor palm in an early stage of the disease showed that 20 to 50 per cent. of the roots when cut at a distance of 1 ft. from the trunk were brown and dead. It was apparent that necrosis had originated at some distance from the base of the palm and had advanced inwards towards the union of the root with the trunk. The xylem vessels of the necrotic root tissue were plugged with fungal spores and hyphae, numerous fungi being isolated. At first, *Phomopsis phoenicicola* and *Diplodia phoenicum* were thought to be causal agents, as they were so commonly present, but seedling palms grown in soil artificially inoculated with these fungi, singly and in combination, remained uninfected. One fungus highly pathogenic in inoculation tests was identified tentatively as a species of *Ceratostomella*, of which the imperfect stage appeared to belong to *Chalaropsis*, but to be distinct from *C. thielavioides* [*R.A.M.*, xiv, p. 801]; this fungus killed some seedlings in 20 days, and other evidence obtained strongly suggested that it is the primary cause of the condition. Preliminary experiments indicate that the fungus is comparatively resistant to certain soil fungicides, and no control methods have yet been devised.

MÉNDEZ (R.). **Algunas enfermedades del Cafeto.** [Some Coffee diseases.] —*Rev. agric. Centr. nac. Agric.*, i, 11–12, pp. 269–279, 5 figs., 1936.

Notes are given on the symptoms, etiology, distribution, and control of *Stilbella* [*Omphalia*] *flavida* [*R.A.M.*, xiv, p. 397], *Cercospora coffeicola* [ibid., xvi, p. 171], *Rosellinia* sp. [ibid., xiv, p. 397], and *Corticium koleroga* [ibid., xv, p. 345] affecting coffee in Costa Rica.

SHAW (L.). **Cotton diseases in North Carolina during the season of 1936.** —*Plant Dis. Reptr*, xx, 22, pp. 347–384, 1936. [Mimeographed.]

The treatment of cotton seed against damping-off [chiefly *Glomerella*

gossypii and *Corticium solani*: *R.A.M.*, xvi, p. 173] on 67 farms in North Carolina in 1936 with 2 per cent. ceresan reduced the average percentages of infection and death from 78 to 10 and from 9 to 1, respectively, increased the average numbers of plants emerging and standing at picking time per 100 ft. of row from 248 to 416 and from 106 to 137, respectively, and augmented the average yield and value of lint and seed per acre from 1,295 to 1,548 lb. and from $68.36 to $81.71, respectively. Using these figures as a basis, it computed that on the 891,000 acres planted with untreated seed in the State during the 1936 season, damping-off caused a reduction in yield of some 133,650,000 lb. of seed cotton, valued at about $7,056,720. Notes are also given on three other cotton diseases.

Fawcett (G. L.). **Notas sobre algunas enfermedades del Algodonero.** [Notes on some Cotton diseases.]—*Circ. Estác. exp. agríc. Tucumán* 52, pp. 3–8, 4 figs., 1936.

Popular notes are given on *Bacterium malvacearum*, *Cercospora gossypina* [*R.A.M.*, xiv, p. 629], and two forms of root rot affecting cotton in the Argentine, one caused by an undetermined Hymenomycete with white hyphae furnished with clamp-connexions, and the other by a *Rhizoctonia* forming a typical chestnut or purple layer over the invaded areas. None of the diseases is of much economic importance under local conditions.

Volf (F.). **Onemocnění kaprů plisni—Mucophilus cyprini Plehn.** [A disease of the Carp caused by the mould *Mucophilus cyprini* Plehn.]—*Zem. Arch.*, xxvii, 5–6, pp. 297–303, 3 figs., 1936.

A brief account is given of two outbreaks of disease among carp in Czecho-Slovakia, the first of which occurred in the month of July [year not indicated], and caused a loss estimated at round about 3,000 out of a total population of over 32,500 carp bred in a lake, and the second occurred in February and killed 130 individuals, weighing from 1 to 2 kg. each, in a sheet of water into which carp had been released during the preceding January. Isolations from the diseased tissues showed that the disease was caused by *Mucophilus cyprini*, first described by Mme Plehn (*Zbl. Bakt.*, Abt. 1, lxxxv, 1921) as a species of the Chytridiaceae, but referred in 1935 by Schäperclaus to the algae. The author, however, accepts the original identification, and describes the fungus as a one-celled mould, 60 to 70 μ in diameter, which develops on the epithelial cells of the gills, and kills the fish by interference with their respiration, without exerting any toxic action. None of the other fish present in the same waters was affected by the trouble.

Malevich (O. A.). Новый вид галофильной плесени с соленой рыбы: **Oospora nitinskii n.sp.** [A new species of halophile mould isolated from salted fish: *Oospora nitinskii* n.sp.]—*Микробиол.* [*Microbiol.*] v, 6, pp. 813–817, 3 figs., 1936. [English summary.]

Russian and English diagnoses are given of *Oospora nitinskii* n.sp., isolated from the surface of salted fish. Two strains of the organism were differentiated, one characterized by echinulate, brown conidia, 6·5 to 11 μ (average 7 μ) in diameter, abstricted in chains of 14 to 40

(usually 25 to 30) from straight, simple conidiophores, 21 to 32 μ in length, and growing exclusively on media containing 5 to 35 per cent. sodium chloride or 10 to 80 per cent. sugar (optimum temperature 24° to 26° C.), while the other differs in its smaller (4·2 to 7 μ), smooth conidia and capacity to grow equally well with or without salt.

Örösi-Pál (Z.). **Über die Melanosekrankheit der Honigbiene.** [On the melanosis disease of the Honey Bee.]—*Z. Parasitenk.*, ix, 1, pp. 125–139, 4 figs., 1936.

An intensive study of melanosis of honey bees [*R.A.M.*, xiii, p. 440] in Hungary revealed its occurrence among workers as well as queens, the causal organism, *Melanosella mors apis* n.g., n.sp., being detected in the intestines under natural conditions and also causing heavy mortality in the workers used in inoculation experiments (feeding with pure cultures). The fungus, which is described in German only, is characterized by pale hyphae, 1·6 to 5·8 μ in diameter, yellow to yellowish-brown, oval oidia, 1·8 to 11·9 by 1·4 to 5 μ, yeast-like cells, 3·1 to 14·7 by 1·5 to 5·2 μ, and dark brown, circular or oval, unicellular (occasionally uni- or biseptate) chlamydospores up to 13 by 10 μ (average 5 to 8·7 μ). Both oidia and chlamydospores also present a concatenate type of formation. Good growth was obtained on plum decoction agar (cultures on which provided the basis for the foregoing diagnosis) and other media; gelatine is liquefied by the fungus, milk coagulated, arabinose, xylose, maltose, and lactose utilized without production of gas, a trace of acid being formed from maltose only; there is no appreciable reduction of nitrates and neither indol nor hydrogen sulphide is formed, but catalase is evolved from liquid carbohydrates.

Davidson (A. M.) & Gregory (P. H.). **The dermatophytes of Manitoba, Canada.**—*Delib. Congr. derm. int.*, ix, 1, pp. 724–731, 9 figs., 1935. [Received January, 1937.]

This revised, annotated list of human ringworm fungi [*R.A.M.*, xii, p. 23] incorporating records made in two hospitals in Winnipeg from 1930 to 1934, includes *Microsporon audouini* (54 patients), [ibid., xvi, p. 253], *M. felineum* (including *M. pubescens*) [loc. cit.] (49), *M.* sp. (34), *Trichophyton violaceum* [see next abstracts] (4), *T. gypseum* [loc. cit.] (10), *T. interdigitale* (8), *T. megalosporon* group (including *T. album*) [ibid., xv, p. 580] (34), *Epidermophyton cruris* [*E. floccosum*: ibid., xvi, p. 253] (5), *Achorion schoenleini* (5), *Pityrosporon malassezi* [ibid., xiv, p. 193] (occurring on the scalp of almost every adult patient examined), *Monilia* [*Candida*] *albicans* [ibid., xvi, p. 254] (4), *Malassezia furfur* [ibid., xv, p. 803] (regularly found in cases of pityriasis versicolor), and *Nocardia minutissima* (*Microsporon minutissimum*) (3 patients).

Catanei (A.). **Caractères de cultures de champignons de teignes provenant de cheveux parasités prélevés depuis longtemps.** [The characters of cultures of ringworm fungi derived from parasitized hairs removed a long time previously.]—*C.R. Soc. Biol., Paris*, cxxiii, 36, pp. 1124–1125, 1936.

Ringworm hairs after six months in the laboratory produced on Sabouraud's agar whitish, velvety colonies, surrounded by a yellowish

band, without spores or spindles, the last-named being formed in profusion, however, in cultures from hair just after removal. The organism concerned is believed to be *Microsporon felineum* [see preceding abstract]. In another case a *Trichophyton* from hair kept 16 months, which commenced by forming non-pigmented colonies, gradually regained the normal purple coloration characteristic of *T. violaceum* [ibid., xv, p. 579; xvi, pp. 40, 253]. The characters associated with pleomorphism in this group of fungi may thus connote the use of old material for cultural purposes.

Catanei (A.). **Les teignes à Alger.** [Ringworms at Algiers.]—*Bull. Soc. Path. exot.*, xxix, 10, pp. 1038–1042, 1936.

Parasitological studies of ringworm among the juvenile population of Algiers extending over the last ten years showed that, as in other parts of Algeria, the agents of trichophytosis of the scalp are more varied in the European than in the native sections of the community, being represented in 18 cases in the former by *Trichophyton glabrum* (7), *T. violaceum* (6) [see preceding abstract], *T. acuminatum* (4) [*R.A.M.*, xv, p. 501], and *T. umbilicatum* (1), and in 151 in the latter by *T. glabrum* (125), *T. violaceum* (25), and *T. fumatum* (1). *Microsporon canis* (*M. felineum*) [see preceding abstracts] was responsible for 11 cases of microsporosis of the scalp, *Achorion schoenleini* for 82 of favus (79 of the scalp and 3 of cutaneous sites), and *Ctenomyces* [*T.*] *mentagrophytes* [*R.A.M.*, xvi, p. 253] for single cases of trichophytosis of the shoulder and kerion of the forearm.

Foley (H.), Parrot (L.), & Catanei (A.). **Sur un cas de teigne cutanée à Trichophyton violaceum chez un indigène adulte en Algérie.** [On a case of cutaneous ringworm due to *Trichophyton violaceum* in an adult native of Algeria.]—*Arch. Inst. Pasteur Algér.*, xiv, 2, pp. 424–425, 1936.

In 1936 the writer examined a case of cutaneous ringworm due to *Trichophyton violaceum* [see preceding abstracts] in a 30-year-old negro in southern Oran, this being the first record of the fungus in question on the skin of an adult in Algeria, notwithstanding its wide distribution as a pathogen of the juvenile scalp.

Lamson (R. W.) & Rogers (E. L.). **Skin hypersensitivity to molds: an attempt to correlate this with clinical allergy.**—*J. Allergy*, vii, 6, pp. 582–589, 1936.

Skin hypersensitivity by intracutaneous test to a glycerine buffer extract of moulds [cf. *R.A.M.*, xvi, p. 178] was detected in 154 out of 1,259 patients (12 per cent.), who gave 333 positive reactions to 9 species (*Alternaria*, *Chaetomium*, *Aspergillus fumigatus*, *A. glaucus*, *A. nidulans*, *A. niger*, *Monilia* [*Candida*], *Mucor plumbeus*, and *Penicillium chrysogenum* [ibid., xiii, p. 304]). Of this group, 13·6 per cent. reacted to no stock allergen. Reactions to *Alternaria* exceeded those for any of the other moulds, the next in order of frequency being *Chaetomium* and *Aspergillus fumigatus* (20, 15·9, and 12 per cent., respectively). The incidence of sensitivity did not appear to be correlated with sex,

but age is evidently a decisive factor in the development of the condition, 75 per cent. of the susceptible individuals being under forty.

SARTORY (A.), SARTORY (R.), MEYER (J.), & WALTER. **Une dermatomycose tropicale causée par un champignon levuriforme : Geotrichoides lambarenensis.** [A tropical dermatomycosis caused by a yeast-like fungus: *Geotrichoides lambarenensis.*]—*Ann. Inst. Pasteur*, lvii, 5, pp. 526–544, 8 figs., 1936.

From the squamae of a case of dermatomycosis (the material supplied by Prof. Schweitzer of the Lambarene Hospital, French Equatorial Africa) the writers isolated a fungus with the following characters. The branched, septate hyphae, less than 1 μ in diameter, are capable of breaking up readily into fragments or in certain conditions to form coremia. Reproduction is effected by blastospores and arthrospores. The former are oval or elliptical and able to multiply by budding to form chains, or irregular and furnished with a double wall; the latter differ from the former in staining readily and by germinating to form elongated hyphae bearing blastospores. Pediculate blastospores were also observed. The polymorphism shown by the fungus is so pronounced that the authors attach great importance to physiological criteria in referring it to *Geotrichoides* as a new species, *G. lambarenensis* [without a Latin diagnosis].

On solid media the colonies are viscous at first and later develop a membranous veil, the colour of which ranges from white to mahogany-brown according to the substratum; on liquid media the veil is more or less rudimentary. The proteolytic properties of the yeast in relation to gelatine, casein, serum, and albumin are very pronounced. Glucose, levulose, galactose, and maltose were extensively utilized, particularly the last-named, while saccharose and lactose were less favourable for the growth of the organism, which developed equally well throughout the range from 27° to 37° C. and was not appreciably impaired by a temperature of 42°. Subcutaneous inoculations on guinea-pigs gave positive results.

MOORE (M.). **Un nuevo tipo de blastomicosis producido por Paracoccidioides cerebriformis n.s.** [A new type of blastomycosis produced by *Paracoccidioides cerebriformis* n.sp.]—*Arch. urug. Med.*, viii, 3, pp. 224–225, 1936.

Paracoccidioides cerebriformis n.sp., isolated from blastomycotic material preserved in the collections of da Fonseca and Almeida at the Oswaldo Cruz Institute [Rio de Janeiro] and San Paulo, Brazil, respectively, is stated to differ in various respects from *P. brasiliensis* [*R.A.M.*, xv, p. 503]. In the tissues or pus the organism attains a diameter of 3 to 30 μ and occurs in the shape of spherical or ovoid, double-walled elements with simple or multiple buds, giant cells resembling those of *Coccidioides immitis* sometimes being also present. Good growth is made on various media at 25° C., the colonies on peptone agar assuming a cerebriform or vermicular aspect and those on beer wort agar forming creamy to pale yellow colonies. The hyphae are 2 to 7 μ in diameter, with numerous short, thick protuberances, and are composed of arthrosporoid, oidioid, or cross bar-shaped cells, the

chlamydospores are spherical, elongated, piriform, or sclerotic, intercalary, lateral, or terminal, and measure up to more than 15 μ in diameter, and the lateral, spherical or piriform conidia are 3 to 10 μ in diameter. The fungus neither liquefies gelatine nor ferments carbohydrates, but slightly acidifies litmus milk. Incubated at 37° the colonies of *P. brasiliensis* are readily distinguishable from those of *P. cerebriformis* by their cottony consistency and more luxuriant growth. The two fungi further differ in their clinical manifestations, though both enter the system through the mouth, those associated with the new species being seldom or never generalized to the same extent as the symptoms arising from infection by *P. brasiliensis*; they are chiefly localized in the buccal cavity, while the maxillary, sub-maxillary, and parotid glands may ultimately be invaded with fatal results.

ROLET (A.). **La pourriture des oignons à fleurs, bulbes, tubercules, rhizomes.** [The decay of flowering bulbs, corms, tubers, rhizomes.] —*Vie agric. rur.*, xxv, 24, pp. 381–384, 1936.

A popular account is given of some diseases affecting flowering bulbs, corms, tubers, and rhizomes in France, with recommendations (based on well-known authorities) for their control by cultural measures and bulb and soil disinfection. Among the fungi listed may be mentioned *Thielavia* [*Thielaviopsis*] *basicola* on begonias and cyclamens [*R.A.M.*, xv, p. 536], *Sclerotinia libertiana* [*S. sclerotiorum*] on dahlias [ibid., xv, p. 370], and *Rosellinia necatrix* on peonies. Various bacteria are also enumerated, including the agent of soft rot of gladioli and *Ixia maculata* [*Pseudomonas gladioli*] and *P. hyacinthi* on hyacinth [ibid., xv, p. 395].

GREGORY (P. H.). **The control of white mould disease of Narcissus.**— *J. Minist. Agric.*, xliii, 9, pp. 865–869, 2 figs., 1936.

Narcissus white mould (*Ramularia vallisumbrosae*) [*R.A.M.*, xiv, p. 366] assumes epidemic proportions only in the south-west of England. The foliage may wither completely a month before the normal time of ripening off, and direct loss of flowers may be caused in late varieties when the stalks are attacked. The most severely affected varieties are Golden Spur, Sunrise, Ornatus maximus, and Double White, while King Alfred, Emperor, Maximus superbus, Henry Irving, Bath's Flame, and Polyanthus show some resistance. The bulbs are not affected. From February to May the fungus is carried from plant to plant principally by wind- and rain-borne spores, which germinate rapidly in moist, but do not survive in dry, weather. During the summer and autumn the fungus persists on withered leaves as sclerotia, from which spores are produced soon after the narcissus shoots appear in winter. Control consists in careful sanitation, the planting of susceptible varieties as far apart as possible, and spraying with Bordeaux mixture (4–3–40) plus a wetting agent. The first spray should be given when the shoots are 3 to 6 in. high, and one or two more at monthly intervals should suffice.

PRESTON (N. C.). **The parasitism of Myrothecium roridum Tode.**— *Trans. Brit. mycol. Soc.*, xx, 3–4, pp. 242–250, 2 pl., 1936.

In the summer of 1932 the author observed the sporodochia of a

Myrothecium closely resembling *M. roridum* [*R.A.M.*, xiv, p. 428; xv, p. 157] on the basal parts of shoots of dead pansies (*Viola*).

Ninety-one inoculations with a spore suspension of the fungus on unwounded internodes and leaves of 16 plants of Maggy Mott and Chantryland violas gave 64 successful infections; inoculations through wounds all yielded pronounced lesions in eight days. When detached shoots of *V. cornuta* were inoculated, 61·8 and 91·4 per cent. of the inoculated internodes and leaves, respectively, became infected. Basal rot developed in rooted cuttings or seedlings inoculated by pouring spore suspensions down the lower part of the stem. The fungus was re-isolated from inoculated plants.

M. roridum is characterized in culture by hyaline to pale brownish hyphae, and straight, continuous, greenish or pale olive spores (jet-black in the mass), with rounded ends, measuring approximately 7 to 8 by 2 μ. It grows well at room temperature, producing a flocculent growth of pure white aerial mycelium. Sporodochia usually develop in abundance; when separate they appear as jet-black dots surrounded by a white rim, but they often coalesce into larger masses, and may form an almost continuous black line round the margin of the culture.

The lesions produced in inoculated viola leaves or stems appear as dark purple-black spots or streaks, which gradually enlarge. The tissues at the centre of the lesions dry up, shrivel, and turn brown, and the outer margin is sharply delimited from the normal green of the leaf by a deep purple-black band. The fungus must be regarded as a potential parasite under natural conditions.

Allen (Ruth F.). **A cytological study of Erysiphe polygoni on Delphinium.**—*J. agric. Res.*, liii, 11, pp. 801–818, 8 pl., 1936 (issued 1937).

In this detailed cytological study of *Erysiphe polygoni* on *Delphinium* [*R.A.M.*, xiii, p. 460] the author states that the vegetative cells are uninucleate and in sexual reproduction the hyphae swell toward each other, forming broad areas of contact, followed by nuclear transfer, the formation of special sexual cells being a matter of expediency rather than necessity. In no case did the two hyphae concerned originate on the same individual and it is probable, although not proved, that heterothallism exists in this species, as in the sunflower mildew (*E. cichoracearum*) [ibid., xv, p. 232].

Pape (H.). **Ueber die neue Bakterienkrankheit der Begonien.** [On the new bacterial disease of Begonias.]—*Blumen- u. PflBau ver. Gartenwelt*, xl, 49, pp. 583–584, 1 fig., 1936.

Begonia leaves affected by the new bacterial disease [*R.A.M.*, xv, p. 808] show predominantly marginal, ill-defined, yellowish-green areas covered on the under surface with minute, dark green, glassy spots, mostly arranged in rows along the fine veins and sometimes coalescing. The diseased tissues die and shrivel, turning a vivid fawn colour, and at this stage the dark spots are also visible on the upper surface, accentuating the veins. Ultimately the entire leaf blade may be involved and killed, while infection may also extend to the petioles and stems, causing discoloration and collapse. The whitish bacterial

exudate from the diseased tissues is apparent to the naked eye under humid conditions. Brief notes are given on two other begonia diseases with which the foregoing might be confused, viz., grey rot (*Botrytis cinerea*) and mosaic [ibid., xi, p. 768].

LACEY (MARGARET S.). **Studies in bacteriosis. XXIII. Further studies on a bacterium causing fasciation of Sweet Peas.**—*Ann. appl. Biol.*, xxiii, 4, pp. 743–751, 1 pl., 7 figs., 1936.

The author states that four strains of the bacterium causing fasciation of sweet peas [*Phytomonas fascians*: *R.A.M.*, xv, p. 723; xvi, p. 102] were isolated from a leafy gall on *Nicotiana glutinosa*, from asparagus galls, from an abnormal growth on *Heuchera sanguinea*, closely resembling the 'cauliflower' disease of strawberries, and from a large gall on a *Gladiolus* corm, all of which produced fasciation on inoculation into sweet pea seedlings. A detailed account is given of histological studies of the inoculated seedlings from two to eleven weeks after inoculation, the results of which showed that abnormal growth occurred in the hypocotyl region. In certain areas bacterial zoogloea formed a film on the outside of the tissue, and some penetration of the bacteria into the epidermal cells, and later into the intercellular spaces, was observed. It was experimentally shown that surface sterilization in 1 in 1,000 mercuric chloride for 5 minutes destroyed nearly all the bacteria, this confirming the conclusion drawn from reisolation experiments and from microscopical examination that the bacterium is mainly restricted to the exterior of the tissue, as described by Robinson and Walkden [ibid., iii, p. 15] for *Bacterium tumefaciens*.

SNYDER (W. C.) & THOMAS (H. R.). **Spotted wilt of the Sweet Pea.**—*Hilgardia*, x, 8, pp. 257–262, 1 pl., 1936.

Sweet peas in the coastal regions of California are frequently affected with a streak disease caused by the tomato spotted wilt virus [*R.A.M.*, xvi, p. 134]. Reddish-brown to dull purple necrotic streaks appear on the stems and petioles, and the leaves and shoots may turn yellow and die. Oval to circular, yellow spots with diffuse margins and usually 5 to 15 mm. long appear on the leaves, later becoming brownish and forming a pattern typical of the virus on other hosts. Some of the blossoms develop a circular pattern in the pigment, the virus being recoverable from such material. Plants infected early may turn yellow and die without showing any other symptoms, while, in other cases, the virus may be limited to local lesions.

The virus was transmitted by juice inoculations by the carborundum method from naturally infected sweet peas to *Nicotiana glutinosa*, tobacco, *Datura stramonium*, tomato, and sweet pea, from tomato showing typical spotted wilt symptoms to sweet pea, and from naturally infected romaine lettuce (*Lactuca sativa* var. *longifolia*), grown near the greenhouse where the disease was found, to sweet pea. The disease was also observed spreading rapidly in fields of head lettuce (*L. sativa* var. *capitata*).

Garden peas showing streak symptoms were occasionally found in the field, and juice inoculations from such plants gave spotted wilt symptoms on *N. glutinosa* and tobacco, and streak on sweet pea.

Inoculations of the spotted wilt virus into Perfection peas from infected tomato, tobacco, and romaine lettuce were successful, and confirmed Whipple's conclusions as to the identity of the pea streak and spotted wilt viruses [loc. cit.]. The virus was successfully transmitted by *Thrips tabaci* to sweet peas (from head lettuce) and to garden peas. Control of streak lies in the isolation of sweet pea plantings and in the protection of plants from migrations of infectious *Thrips*.

GIGANTE (R.). **Il mosaico della Violaciocca** [Stock mosaic].—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 3, pp. 166–174, 1 pl., 9 figs., 1936.

In 1931 and 1936 stocks (*Matthiola incana*) in the vicinity of Rome occasionally showed symptoms of a mosaic disease. Light green, later yellowish-green to dark yellow, irregularly distributed areas with a well-defined edge appeared on the leaves, which also developed protuberances and became very irregular and contorted; the older leaves turned brown and finally fell off. In some cases, the edges appeared as if slashed. The apical nodes were close together, resulting in a rosette formation of the leaves, and the stems and branches were thin and sometimes sharply bent or twisted. The roots were thin and not infrequently fasciated. Affected plants were dwarfed and the stem and branches withered from the apex downwards, this process unless arrested resulting in death. The flowers on affected plants either remained small and sickly or dried up, rendering the plants commercially worthless. X bodies 4·5 to 10·5 μ long were present in the cells of the palisade and spongy tissues of the diseased leaves.

The disease was successfully transmitted when cotton wool soaked in infected juice was rubbed on healthy leaves, or inserted in wounds in the stems, or when infected juice was injected into healthy branches. In these cases the primary symptoms appeared in the inoculated plants within two to three weeks. It was also transmitted by grafting a diseased branch on to a healthy plant, or vice-versa, but inoculations by means of aphids (*Macrosiphum* sp.) were unsuccessful.

PAPE (H.) & ENGELHARDT (F.). **Pilzkrankheit an Treibwicken.** [A fungous disease of greenhouse Vetches.]—*Blumen- u. PflBau ver. Gartenwelt*, xl, 48, p. 578; 52, p. 627, 1936.

In reply to the query of a correspondent concerning a disease of greenhouse vetches, H. Pape attributes the pale grey spotting of the leaves, followed by complete defoliation, to infection by *Cladosporium* [or *Hyalodendron*] *album* (*Erostrotheca multiformis*) [*R.A.M.*, ix, p. 629; xiv, p. 69]. The disease is promoted by high atmospheric humidity and warmth and may be combated by repeated applications of sulphur dust.

F. Engelhardt draws attention to the liability of sulphur dust to burn the flowers (it can safely be used on younger plants), and advises the substitution of erysit [ibid., xv, p. 583] (75 c.c. per 10 l. water) for the later stages of the disease.

GREGOR (MARY J. F.). **A disease of Cherry Laurel caused by Trochila laurocerasi (Desm.) Fr.**—*Ann. appl. Biol.*, xxiii, 4, pp. 700–704, 1 pl., 1936.

The author describes a leaf spot of cherry laurel (*Prunus lauro-*

cerasus) observed in 1932 in Dumfriesshire, the causal organism of which was identified as *Trochila laurocerasi* by Miss Wakefield, who stated that some years previously she had seen a similar case at Norwich. At first the spots are yellowish with very indefinite margins, but later become sharply delimited; larger spots may not infrequently consist of several more or less concentric rings, the colour of which sometimes markedly varies from greyish-brown to a deep red-brown. The fructifications of the fungus are mainly confined to the upper surface of the leaves; *Gloeosporium* acervuli are formed first and are succeeded by apothecia of *T. laurocerasi*. The affected leaf areas drop out, leaving circular to irregular holes, and Dr. Pethybridge is stated to have observed lesions on the green parts of the twigs as well.

Monoconidial or mono-ascospore cultures of the fungus were identical in every respect, and on pieces of sterilized cherry laurel leaves the *Gloeosporium* stage was quickly followed by apothecia, thus establishing the genetic connexion between the two stages. The conidial stage was identified as *G. phacidiellum* Grove, and agreed in every detail with the type specimen, the dimensions of the spores being 11·9 to 18·6 by 4·2 to 6·3 μ, compared with 12·3 to 17·9 by 3·9 to 7·4 μ for the type, though those given in the original diagnosis were 18 to 20 by 7 to 8 μ.

The results of numerous inoculation experiments during the spring and summer months showed that young cherry laurel leaves become infected most commonly through wounds, and that a moist atmosphere is essential for the development and spread of the disease. Attempts to infect leaves during late autumn or in their second year of growth consistently gave negative results. The control measures recommended consist of spraying the diseased bushes with colloidal sulphur during spring and early summer, and of cutting back the bushes only in the autumn, not at short intervals during the summer, as is frequently the practice.

Wollenweber (H. W.) & Hochapfel (H.). **Beiträge zur Kenntnis parasitärer und saprophytischer Pilze. III. Fusarium und Cylindrocarpon und ihre Beziehung zur Fruchtfäule.** [Contributions to the knowledge of parasitic and saprophytic fungi. III. *Fusarium* and *Cylindrocarpon*, and their relationship to fruit-rotting.]—*Z. PflKrankh.*, xlvi, 11, pp. 534–544, 1936.

Continuing their studies of imperfect fungi associated with fruit rots [*R.A.M.*, xvi, p. 191] the authors give details of their inoculation experiments on apples, pears, plums, and tomatoes with *Fusarium avenaceum* (and its form 1), *F. scirpi* var. *acuminatum*, *F. oxysporum* var. *aurantiacum*, *F. orthoceras* var. *longius*, *F. bulbigenum*, *F. equiseti*, *F. moniliforme* var. *minus*, *F. semitectum* [ibid., xv, p. 775], *Cylindrocarpon heteronemum*, *C. mali* [*Nectria galligena*: ibid., xv, p. 514], *C. mali* var. *flavum*, *C. album*, *C. candidum* var. *majus*, *C. curvatum* [ibid., xv, p. 605], and *C. radicicola* var. *violaceum*, all of which were isolated from various dessert and vegetable fruits. The results of the tests, which were carried out at room temperatures, showed that the organisms varied widely in their fruit-rotting capacities, and that none of them attacked plums. All the species of *Cylindrocarpon* were pathogenic to apples, pears, and tomatoes, while the last-named fruit was

rotted by all the species of *Fusarium* tested, and apples and pears by all except that no rotting was caused by *F. moniliforme* var. *minus* on pears, by *F. orthoceras* var. *longius* or *F. bulbigenum* on Ananas Pippin apple, by *F. oxysporum* var. *aurantiacum* on Roter Eiser apples, nor by *F. equiseti* and *F. semitectum* on either apples or pears. Apples were rotted by strains of *F. scirpi* var. *acuminatum* isolated from apples or tomatoes, but not by those isolated from *Buxus* sp. or maize.

Richter (H.). **Fruchtfäule durch den Erreger des Obstbaumkrebses (Nectria galligena Bres.).** [Fruit rot caused by the agent of fruit tree canker (*Nectria galligena* Bres.).]—*Angew. Bot.*, xviii, 6, pp. 477–481, 4 figs., 1936.

In August, 1936, the writer observed an attack of fruit rot by *Nectria galligena* [see preceding abstract] on apples on a tree of an undetermined variety in the Lüneburger Heide, Germany, the symptoms agreeing in the main with those described by Osterwalder from Switzerland [*R.A.M.*, xi, p. 247]. The tissues turned brown and sank from the calyx upwards and later bore sporodochia of the fungus. Most of the diseased fruits dropped prematurely, but those infected at an early stage were completely disintegrated and remained hanging on the tree in a mummified condition. The trees of other varieties surrounding the infected one remained unaffected.

Jamalainen (E. A.). **Boorin viakutus knoppataudin esiintymiseen Omenissa.** [The effect of boron on the occurrence of cork disease in Apples.]—*Valt. Maatalousk. Julk.*, 89, pp. 5–19, 2 figs., 1936. [English summary.]

Details are given of experiments in the control of cork disease or internal cork of apples in Finland [*R.A.M.*, xv, p. 446; xvi, p. 261]. In June, 1935, each of four trees was supplied with 20 gm. boric acid incorporated in the soil round the trunk within the radius of the leaf crown. One of these trees, the whole crop of which was affected in the previous year, bore only 15 per cent. of corky fruits. In further experiments in 1936, boric acid was similarly applied to the soil round four trees at the rates of 200 and 500 gm., while three other trees received injections of the compound at concentrations of 3, 5, and 10 gm. Not a trace of cork disease was detected in the trees to which the soil treatments were applied or in that receiving an injection of 5 gm. boric acid; there were 9·9 per cent. affected apples on the tree given 3 gm. and 18·6 per cent. on that receiving 10 gm., though none of the fruits on the injected branch itself was corky. No injury followed any of the soil treatments or the 3 and 5 gm. injections, but the maximum quantity of 10 gm. induced foliar injury. In other tests in different localities the application of 100 or 200 gm. boric acid to the soil at the base of the trunks gave almost complete control of cork disease without damaging the trees. As a result of these investigations the writer proposes to adopt the soil treatment with 100 to 200 gm. boric acid (equivalent to 200 to 400 gm. borax) in future operations against the cork disease, to be applied preferably immediately after blossoming.

Attention is drawn to certain important analogies between internal cork of apple and other boron deficiency disturbances, e.g., brown heart

of swedes [ibid., xvi, p. 225], including the predominant involvement of the meristematic cells or succulent portions of the plant and the low sugar content of the diseased tissues.

HILL (H.) & DAVIS (M. B.). **Physiological disorders of Apples.**—*Sci. Agric.*, xvii, 4, pp. 199–208, 4 pl., 1936. [French summary.]

An account is given of the authors' observations and investigations during five years of the disorders of apples in the provinces of Quebec and Ontario known as cork or internal cork [see preceding abstract], corky core [*R.A.M.*, xvi, p. 260], and tree pit or bitter pit [ibid., xv, p. 812]. As a result of their work, the authors are led to believe that cork and corky core are but two varietal expressions of the same disorder. No correlation could be established between the occurrence of these troubles, either in pots or in the field, and the amount of root injury, but internal cork was experimentally produced by waterlogging or subjecting to drought conditions trees in pots which previously had only produced healthy fruit. A marked correlation was observed between the incidence of the disorders in pot-grown trees and prolonged heavy applications of nitrogen, irrespective of other conditions. In general, these diseases have been found to be associated with soils with a high carbonate lime content, high percentages of nitrogen and organic matter, especially in association with shallow-rooted trees where the subsoils are compact, soil moisture excess or deficiency together with high percentage of nitrogen and organic matter, and low available potash and a high phosphorus-potassium ratio, especially in the lower soil horizons. Boron used in solution with trees in pots or injected into trees in the solid form in the orchard effected control of internal cork, corky core, and drought spot. At high P_H values of the soil due to overliming, or to a natural high lime or magnesia content, boron may be relatively unavailable.

TURNBULL (J.). **Commercial fruit-spraying demonstration in West Norfolk.**—*J. Minist. Agric.*, xliii, 9, pp. 846–854, 1936.

The author gives a detailed account of a successful attempt to demonstrate in a 10-acre plantation of badly cropping Bramley and Emneth apple trees how thoroughness in spraying can be achieved easily and rapidly with very beneficial effects on the crop, by using high pressure and short lances with double nozzles, as designed and described by him [*R.A.M.*, xiv, pp. 114, 369]. It is stated that the sizes of disks have now been standardized, and are measured in sixty-fourths of an inch.

SHIMA (Y.). **Studies on the young fruit-rot of Apple-tree.**—*J. Fac. Agric. Hokkaido Univ.*, xxxix, 3, pp. 143–270, 9 pl., 1936.

An exhaustive, fully tabulated account is given of the writer's studies during the period 1924 to 1932 at the Aomori Agricultural Experiment Station and at Hokkaido on the destructive blossom blight and rot of young apple fruits caused by *Sclerotinia mali* Takah., of which *S. malicola* M. Miura is considered to be a synonym, while *Phaeosclerotinia nipponica* Hori [*Lambertella corni-maris*: *R.A.M.*, xv, p. 531] may be differentiated by its brown conidia and ascospores.

The disease may be divided into four phases, namely, leaf and blossom blights, young fruit rot, and axis blight. Leaf blight appears on young leaves of the fruit spurs when the flower buds are in the pink stage as a reddish-brown lesion which extends to the petiole and axis of the flower cluster. Usually only one or two leaves of a rosette are infected. Blossom blight normally develops 3 or 4 days after the leaf blight, and is caused by the fungus invading the axis and other petioles or pedicels, causing the whole cluster to wilt. The disease appears before the blossoms are open, and on affected clusters dark grey or greyish-white pustules [cf. ibid., xvi, p. 190] are found in abundance. Young fruit rot is first manifested as a brown fleck about half way down the fruit with a light brown exudation from the lesion. The exuded juice flows down the stalk and dries up, causing a dirty yellowish-brown staining. The area of the lesion remains as a greyish-brown depression on one side of the fruit, which becomes lop-sided. Most of the affected fruits fall, but some may be left hanging till the following spring. Pustules are borne in wet weather. Axis blight is caused by invasion from the affected young fruits, but the girdling of the axis is slow enough to allow the fungus to infect other fruits of the cluster. When the axis is girdled the cluster dries up and hardens. Greyish-white pustules are formed, and the production of conidia is sometimes observed.

The leaf blight symptoms occur in late April to early May. Both macro- and micro-conidia are produced on the leaves or stem in 4 or 5 days, and the macroconidia are carried by the wind or insects to the blossoms on opening. Young fruit rot occurs about ten days after anthesis, and subsequently axis blight. Sclerotia are formed in the young fruits and stem, and the fallen sclerotia form apothecia in late April or early May, just in time to cause the leaf blight symptoms.

The leaf and blossom blights were shown by inoculation experiments on the Jonathan, A. S. Pearmain, and Ralls varieties to be caused by the ascospores of the fungus, while the fruit rot and its natural extension, axis blight, are usually the result of conidial infection of the stigmas, though ascospores are also capable of stigma infection. Only the very young leaves were susceptible to infection either with ascospores or conidia. None of the 25 varieties tested in 1927 and 1928 proved to be resistant to fruit rot, while only 6 out of 113 remained free from infection in a serious epidemic in 1931, and these formed too few blossoms to yield significant data. Positive results were given by inoculation of the stigmas of Flemish Beauty pears, Japanese pear (*Pyrus serotina*), quinces, and medlars (*Mespilus germanica*), whereas cherries and plums (*Prunus salicina*) reacted negatively to the fungus.

The hyphae arising from the ascospores on the surface of the stigma enter the style between the papillate cells of the stigma, proceed straight down the conducting tissue without branching, and invade the seed cavity through the sutures of the carpel margins, whence they migrate downwards along the epidermal surface of the carpel or the placenta towards the funicle and ultimately reach the nucellus through the micropyle. The presence in the withered ovules of deeply stained hyphae indicates that infection through the stigmas is the primary cause of the abscission phenomena in young fruits. Hyphal growth is influenced by temperature, the embryo sac being invaded 48 hours

after inoculation during a warm spell in the blossoming period of 1930, while in the cooler weather of 1931 the time required for infection was 120 hours.

The macroconidia are shortly ellipsoidal to lemon-shaped, obtusely papillate, hyaline, 11·7 to 7 by 9·4 to 4·7 μ in diameter with typical disjunctors. The formation of conidia on diseased organs of the previous year has not yet been observed in nature or induced in culture. [No description is given of the apothecia or microconidia.]

Control of the leaf and blossom blight phases of the *Sclerotinia* disease should be based on the collection and destruction, by burning or burying, of diseased leaves, petioles, stalks, and fruits, all of which harbour the sclerotia of the fungus, and by the application of lime-sulphur (Beaumé 4·5° to 5·0°) at the dormant or green tip stage followed by lime-sulphur or Sapporo mixture (0·8 per cent. Bordeaux mixture plus sodium arsenite) at the delayed dormant stage, and Sapporo mixture at pink and petal fall stages, the last two applications being of lesser importance. Spraying is ineffectual against the fruit rot and axis blight, but their incidence may be minimized by the adoption of cultural methods conducive to the prevention of fruit abscission; the bearing of nutritional factors on this phenomenon is discussed at some length.

Piehl (A. E.) & Hildebrand (E. M.). **Growth relations and stages in the life history of Fabraea maculata in pure culture.**—*Amer. J. Bot.*, xxiii, 10, pp. 663–668, 22 figs., 1936.

In a cultural study [which is fully described] of the quince and pear leaf blight and fruit spot organism (*Fabraea maculata*) [*R.A.M.*, xv, p. 260] the best medium for the development of the conidial stage (*Entomosporium maculatum*) was potato dextrose agar, on which the colonies were white, round, smooth, later fimbriate, changing to yellow and finally to reddish-brown. Numerous conidia were liberated and readily scattered, starting new growths surrounding the old colonies. These individual colonies show a concave centre which becomes darkened, or yellowish and shiny when conidia are found in abundance. The best growth was obtained at 18° and 21° C., and the optimum hydrogen ion concentration was between P_H 6·8 and 7·4.

The perfect stage of the fungus developed in pure culture isolated originally from conidia. A 5 per cent. sucrose solution was poured into Petri dishes and healthy green quince leaves floated in it. After sterilization pieces of pure conidial cultures were placed on the leaves and left to incubate at room temperature. As the water in the sugar solution evaporated the white mycelial mass turned black and became much smaller, and showed the presence in groups, arising from a stroma, of asci with bicellular ascospores typical of *F. maculata*. Ascogonial coils were found in the mycelium surrounding the ascogenous material. The presence of these coils and of what appeared to be spores simulating spermatia in some of the cultures suggests that they may be elements in a sexual mechanism. Attempts to culture the fungus from individual ascospores were unsuccessful. The closed fruit body is an early stage of development, for the mature asci formed in culture were situated on a stroma free from any kind of covering. As the asci

are produced the contents of the ascocarp swell and cause the closed fruiting body to spread open into a typical apothecium (resembling the type found in the Phacidiales), as described by Atkinson (*Science*, xxx, p. 452, 1909).

Wilson (E. E.). **Symptomatic and etiologic relations of the canker and the blossom blast of Pyrus and the bacterial canker of Prunus.**— *Hilgardia*, x, 8, pp. 213–240, 6 figs., 1936.

A comparative study of pear bacterial canker in California [*R.A.M.*, xiii, p. 641] and stone fruit canker due to *Phytomonas* [*Pseudomonas*] *cerasi* [ibid., xiii, p. 451] showed that in the former considerable loss is sometimes caused by infection of the small branches and twigs. In both diseases, infection takes place through dormant buds and leads to the death of twigs and small branches. The infection of the fruit cluster bases in the pear disease has no counterpart in the stone fruit disease; furthermore, no bacterial exudate occurs in the blossom blast phase of the pear disease, and no symptoms are produced on the leaves. Generally speaking, however, the pear and stone fruit diseases showed marked similarities in the parts attacked, in appearance of the invaded tissue, and in seasonal distribution.

In comparative inoculation tests on Japanese plum (*Prunus salicina* and *P. munsonia* hybrid), European plum, apricot, peach, sweet cherry, and pear, the California pear organism (from limb cankers and from blossoms) were pathogenic to all, and *Phytomonas* [*Pseudomonas*] *citriputeale* [ibid., xv, p. 575], *Phytomonas* [*Pseudomonas*] *utiformica* [ibid., xiv, p. 16, and above, p. 302], the pear blast organism isolated by H. R. Rosen in Arkansas [ibid., xvi, p. 157], *P. cerasi*, and *P. cerasi* var. *prunicola* were pathogenically similar to it. A Californian culture from limb canker of apple (No. I) was pathogenic to Japanese plum and apricot, but gave doubtful results on European plum, peach, and sweet cherry, while another strain (No. II) from the same host gave doubtful results on Japanese plum, the only host tested. *Phytomonas* [*Pseudomonas*] *papulans* [ibid., xiv, p. 319] produced no symptoms on any of the stone fruits. Evidence obtained in orchards indicated that spread of bacteria takes place from stone fruit trees to pears.

Cultural tests showed that the Californian pear cultures consistently differed among themselves in that three cultures from limb canker of Wilder pear produced fluorescence on potato dextrose agar, whereas cultures isolated from twigs and blossoms did not, a characteristic similar to that separating *P. cerasi* from *P. cerasi* var. *prunicola*. The parallel fluorescigenic variability on potato dextrose agar, and similar reactions in all other tests, of the stone fruit and Californian pear cultures gave no indication that they were very different from one another. The apple culture I was very similar to the pear cultures, whereas culture II was clearly distinct from the latter. *P. papulans* was unlike any of the other organisms studied. *P. citriputeale*, *P. utiformica*, and the pear blast cultures from Arkansas agreed culturally with *P. cerasi* var. *prunicola* and with those Californian pear cultures that were not fluorescent on potato dextrose agar. Both in the pathogenic and cultural tests the only clear differences were those of *P. papulans* and apple strain II, though the rest of the cultures showed

certain minor cultural differences. Host source did not appear to be an important line of cleavage.

It is concluded that the limb canker and blossom blast of pear are phases of the same disease, the organism causing which, together with *P. cerasi*, *P. cerasi* var. *prunicola*, *P. citriputeale*, *P. utiformica*, Rosen's organism, and the stone fruit organism should be included in one species, the correct name for which would appear to be *P. syringae*. The bacterium designated *P. papulans* is an unrelated species.

BAINES (R. C.). **The status of Peach virus diseases in Indiana.**—*Hoosier Hort.*, xviii, 12, pp. 180–182, 1936.

In October, 1936, a peach tree infected by the phony disease [*R.A.M.*, xvi, p. 192] was detected in Posey County, Indiana, and during the previous summer a number of plum trees in the State were observed to be suffering from mosaic, which is liable to spread from this host to the peach [loc. cit.]. In this connexion notes are also given on yellows, little peach [ibid., xvi, pp. 109, 157], red suture, and rosette of peaches [ibid., xvi, p. 109], none of which is widespread in Indiana at the moment, probably owing largely to the high summer temperatures prevailing in the State, coupled with the virtual absence of insect vectors. Planting stock should be secured exclusively from reliable sources and a careful watch kept for the first signs of any of the above-mentioned diseases.

KUNKEL (L. O.). **Peach mosaic not cured by heat treatments.**—*Amer. J. Bot.*, xxiii, 10, pp. 683–686, 1 pl., 1936.

The symptoms of the Colorado peach mosaic [see preceding abstract] used in these studies are described in some detail from material grown in the greenhouse. The earliest sign of infection is a slight bending in the main stem of rapidly growing trees a little below the growing point. Shortly after, small, chlorotic spots appear in one or more leaves near fast growing tips, usually on one side of the midrib in the lowest part of the lowest affected leaf. In the leaf above they generally develop on both halves. As the chlorotic spots enlarge they may fuse, the leaves later showing a shot-hole effect. The diseased trees may produce apparently normal leaves during the rest of the season, or they may produce narrow, malformed, deep green leaves. Affected trees bearing apparently healthy leaves are stunted. When growth is resumed, mottling accompanied by leaf stunting and malformation usually develops at the tips of main stems and branches.

All attempts to transmit the disease by juice inoculations gave negative results, but transmission was readily effected by budding.

Heat treatments at 34·4° to 36·3° C. sufficiently prolonged to cure peach yellows, rosette, little peach, or red suture [ibid., xvi, pp. 109, 157] had no effect on the condition, and the virus was not inactivated in bud sticks held at 35°, 42°, or 50° for periods approaching the limit of endurance of peach tissue. Peach mosaic, therefore, is apparently not closely related to yellows, rosette, little peach, or red suture.

GÜLL (A.). **Die Narren- oder Taschenkrankheit der Zwetschen.** [The crazy or pocket disease of Plums.]—*Obst- u. Gemüseb.*, lxxxii, 12, p. 190, 1936.

A popular note is given on the pocket plum disease caused by *Taphrina pruni* [*R.A.M.*, xiii, p. 706], which is stated to have been widespread in Germany in 1936 as a sequel to particularly favourable spring weather conditions. All diseased material should be promptly excised and destroyed.

THOMAS (H. E.) & HILDEBRAND (E. M.). **A virus disease of Prune.**—*Phytopathology*, xxvi, 12, pp. 1145–1148, 1 fig., 1936.

Since 1930 Fellenberg prune trees in Niagara County, New York, have been sporadically infected by a virus disease causing stunting, excessive narrowness, mottling, and rugosity of the leaves, the last-named feature being more conspicuous near the midrib than towards the margins, which are frequently so irregular in outline as to suggest insect infestation. The leaf surfaces present a somewhat glazed appearance. All the leaves on a given shoot are more or less affected, especially near the base, and the internodes shortened. An unusual feature of the disease is the development of an occasional apparently normal shoot in the midst of severely affected buds. In many of the blossoms the pistils are abortive and the petals narrow and irregular. The fruits of diseased trees seldom reach maturity. The disorder was successfully transmitted by grafting to a limited number of prune and plum trees, but not to cherry or peach, while negative results were given by experiments in its conveyance by means of aphids. It seems improbable that the disease under observation is identical with the plum and peach virus reported from Kentucky [*R.A.M.*, xii, p. 454] (and also observed on Santa Rosa plums in California), with any of Atanasoff's group of mosaics of drupaceous fruits [ibid., xiv, p. 642], or with certain allied disturbances of plum and peach now under investigation by D. Cation in Michigan, and though similar symptoms have been reported for prunes in Holland [ibid., x, p. 252] these are said to occur there also on cherry and peach.

ARTEMIEFF (G. V.). Грибные болезни **Feijoa sellowiana Berg.** [Fungal diseases of *Feijoa sellowiana* Berg.]—*Pl. Prot. Leningr.*, *1936*, 8, pp. 138–142, 1936. [English summary.]

This is a slightly expanded version of the author's recently noticed communication on the fungal diseases of *Feijoa sellowiana* in the Caucasus [*R.A.M.*, xv, p. 593], giving, in addition to the information already reviewed, the Latin diagnoses of the species described by him as new to science, and a list of the fungi recorded on this host by previous workers.

HÉRANGER (S. F.). **La persistance des liquides et le mouillage des végétaux.** [The persistence of liquids and wetting of plants.]—*Rev. Vitic., Paris*, lxxxv, 2215, pp. 449–453; 2216, pp. 472–477; 2217, pp. 491–498, 1 fig., 2 diags., 2 graphs, 1936.

The results of further studies on the 'wettability' of spray liquids [*R.A.M.*, xiv, p. 556] showed that when a liquid is allowed to flow

slowly along an inclined rod [the substance of which is not indicated] it first spreads for a definite distance in a uniform thin sheath, and then begins to gather into separate drops, which follow each other at more or less regular intervals. The first phase, termed 'persistence', is constant for a given liquid at the same temperature, and may be readily determined by means of a simple apparatus (persistometer), which is briefly described. On rods of sufficient length the phenomenon of persistence is repeated several times, in that after gathering into drops the liquid spreads out again and then gathers up into drops once more, and so on. The writer shows that the length of the persistence phase is directly related to the spreading capacity of a spraying liquid, which can thus be determined by a simple and rapid test. The term 'mouillance' is now re-defined as the length of the film formed by the liquid tested (owing to its persistence) on a rod, after plunging it vertically into the liquid; it is measured in lengths of centimetres, each of which is considered to be a unit of 'mouillance'. A simple apparatus, termed a 'standardized mouillometer', based on this principle, enables one to read off on a graduated scale the length of the liquid film adhering to the rod. With its help the 'mouillance' of Paris tap water was determined as ten units, and that of alkaline 2 per cent. Bordeaux mixture and of alkaline 2 per cent. Burgundy mixture as 8·5 units. Used to test the effect of various spreaders on water and the two spray mixtures, it showed that the effect of a given substance varies with the nature, concentration, and temperature of the liquids; of the substances tried, terpenic alcohol [ibid., xv, p. 736] was more effective (17 mouillances) in Bordeaux mixture than fat sulphonated alcohol (16 mouillances), and both substances were of equal efficacy (17·5 mouillances) in Burgundy mixture. Ox bile imparted a mouillance of 15 to the Bordeaux and of 16·5 to the Burgundy mixture. The work indicated that there is a limit for any of the spreaders that were tested, beyond which their effect on the spreading quality of the sprays was the reverse of that desired. The practical advantages of the apparatus (which is patented) are briefly discussed.

Marsh (R. W.). **Notes on a technique for the laboratory evaluation of protective fungicides.**—*Trans. Brit. mycol. Soc.*, xx, 3–4, pp. 304–309, 1 fig., 1936.

Parallel tests are described on leaves and slides for the laboratory evaluation of protective fungicides. Microscope slides were dipped into a solution of nitro-cellulose in butyl acetate, drained, and dried, the film being sealed at the edges when required for leaching tests. The slides were then sprayed with the fungicide following a standardized method involving the use of the atomizing apparatus devised by Evans and Martin [*R.A.M.*, xv, p. 382] which was adjusted to give an even deposit of droplets at the rate of 0·05 c.c. of spray fluid per sq. in. The slides were then dried, and three drops (each 0·015 c.c.) of a suspension of conidia of *Venturia inaequalis*, taken from the youngest natural infections on Crimson Cox apple leaves, were placed in line on the sprayed side of the slide, each drop containing 200 to 300 conidia. The inoculated slide was then inverted and enclosed over water in a Petri dish, spore germination counts being made after 24 and 48 hours.

For the leaf tests a single Crimson Cox apple leaf about 1½ in. long was selected near the tip of a shoot and allowed to remain attached to the stem, all the others being removed. The leaf was then sprayed on the upper surface in the same manner as the slides, and allowed to dry. For leaching tests the leaf supported horizontally was sprayed with distilled water at the rate of 12 l. per hour from a fine rose, fixed 1 ft. above the leaf surface, for an hour, and again allowed to dry. Two drops of inoculum, each of 0·015 c.c., were placed on either side of the midrib on the upper surface, and the inoculated leaf was at once covered by a glass bulb open at the lower end which fitted within the top of the tube holding the shoot and was sealed by the water. Germination of the spores was determined on excised portions of the leaf after 24 and 48 hours.

Using this technique, the author found that spray deposits from cuprous cyanide, cupric ferrocyanide, and lime-sulphur were less fungicidal on leaves than on the slide.

ROBERTS (J. W.). **Recent developments in fungicides : spray materials.** —*Bot. Rev.*, ii, 12, pp. 586–600, 1936.

A review is given of recent developments in the improvement of the older standard fungicides and the evolution of new ones, with special reference to fruit disease control in the United States. The preparations are divided into three groups, those with a basis of (1) sulphur, (2) copper, and (3) other essential ingredients, while spreaders and stickers are briefly discussed in the concluding section. Most of the papers cited in the bibliography of 102 titles have been noticed in this *Review*.

MCBRYDE (MARY C.). **A method of demonstrating rust hyphae and haustoria in unsectioned leaf tissue.**—*Amer. J. Bot.*, xxiii, pp. 686–688, 2 pl., 1936.

A new method of staining rust infected leaf material *in toto* is described. It consists in clearing the tissue in a saturated solution of chloral hydrate, staining in a 2 per cent. solution of acid fuchsin in 70 per cent. alcohol diluted with a saturated solution of chloral hydrate and 95 per cent. alcohol, destaining in a saturated solution of chloral hydrate, dehydrating in 85, 95, and 100 per cent. alcohol, counterstaining for 5 minutes in a strong solution of picric acid in oil of wintergreen, clearing (5 minutes) in oil of wintergreen, and mounting in balsam.

WATSON (MARION A.). **Factors affecting the amount of infection obtained by aphis transmission of the virus Hy. III.**—*Philos. Trans. roy. Soc.*, Ser. B., ccxxvi, 540, pp. 458–489, 9 graphs, 1936.

Preliminary tests made to ascertain the effect of various factors on the percentage infection obtained with the virus Hy. III [*R.A.M.*, xiv, p. 51], using the insect vector *Myzus persicae*, showed that tobacco was slightly more susceptible than *Hyoscyamus* [*niger*], the percentages of infection being 52·00 and 43·56, respectively, and the remainder

of the experiments were therefore carried out with tobacco. There was no apparent difference in efficiency between the two hosts as sources of infection. A comparison between tobacco leaves of different ages showed that the first two leaves of a young plant, though the most satisfactory for aphid feeding, were not the most efficient sources of inoculum, and the third leaf was chosen whenever possible. Owing to differences in susceptibility between leaves of different ages on the same plant, the aphids were fed on the first true leaf or a random selection of first and second.

In weekly inoculations over 14 months, maximum percentage infection was obtained during winter (October to mid-January), and a minimum during summer, whatever the number of insects used per plant. The annual range of infection for 1 aphid was between 5 and 40 per cent.; for 5, 20 to 80 per cent.; for 10, 40 to 95 per cent., and for 20, 75 to 100 per cent.

The percentage of infection increased with the number of aphids used per plant, 1, 5, 10, and 20 aphids per plant giving, respectively, out of 240 plants inoculated in each test 28, 127, 163, and 190 infected plants. Evidence is adduced indicating that each infection is local and independent, and not due to the cumulative effect of individually inadequate doses. Low percentage infections obtained with single insects for many viruses do not necessarily indicate low efficiency in the vectors, but are frequently due to fluctuations in infective capacity occasioned by the experimental conditions.

When 1 to 20 aphids fed for 12 hours on infected leaves were allowed to feed for varying periods on healthy seedlings the percentage infection increased with increase in the feeding period. The percentage infection produced on 114 plants by 1 aphid fed on them for 3 to 48 hours ranged from 6·6 to 27·8 per cent., respectively, the corresponding range for 20 aphids being 81·8 (on 72 plants) to 89·3 per cent. (on 69 plants). There appeared to be no distinct time interval preceding possible infection that could be regarded as an incubation period.

For 95 per cent. of the aphids the time occupied in settling down to feed ('penetration time') was under 10 minutes, the average time required for 560 aphids being 4·88 minutes. Penetration time was longer on some days than others, variation being negatively correlated with relative humidity in the insectary at feeding time.

Preliminary experiments made to ascertain the effects of variation in feeding periods on infected plants gave a somewhat unexpected result, the percentage infection of healthy plants decreasing with increased feeding periods on the infected plants; a very much higher number of infections was obtained after 3 and 5 minutes' than after 12 hours' feeding. More comprehensive experiments arranged on a factorial design confirmed this result, the highest percentage infection, 60 per cent., being reached after 2 minutes on the diseased plants, the figure falling rapidly to 11 per cent. for 1 hour, and then rising very slowly to 21 per cent. for 12 hours.

The aphids were ascertained to be capable of infecting more than one plant consecutively without intermediate access to any source of infection, but the number of second infections decreases rapidly with increasing time on the healthy plant and is negligible after one hour.

GORDON (H. D.). **Mycorrhiza in Rhododendrons.**—*Rep. Brit. Ass., 1936*, pp. 424–425, 1936.

Rhododendron roots in nature are stated regularly to harbour an endophytic fungus of the type encountered in *Calluna*, *Vaccinium*, and the majority of the Ericaceae [*R.A.M.*, xv, p. 308]. Infection appears to be confined to the roots and has not been observed in the stem, leaf, fruit, or seed. The endophyte is not seed-borne, seedling infection normally taking place through the soil several weeks after germination. Seeds have been germinated, and the resultant seedlings grown in pure culture without the endophyte or any other micro-organisms. The fact that such seedlings are capable of normal growth and the production of a copious root system is considered to prove that there is no obligate relation between the higher plant and the endophyte.

ISAKOVA (Mme A. A.). **On the problem of the nature of the action of bacteriorhizal microorganisms on plants.**—*C.R. Acad. Sci. U.R.S.S.*, N.S. iv, 9, pp. 429–432, 1936.

A tabulated account is given of experiments in which the action was studied of bacterial suspensions obtained from bacteriorhiza [*R.A.M.*, xv, p. 520] of cotton, wheat, tobacco, beans [*Phaseolus vulgaris*], and from a soil mixture, on the germination of cotton, Indian tobacco, and wheat seeds. When seeds of cotton and tobacco were sprinkled with the suspensions, the germination of cotton was most accelerated by the cotton bacteriorhiza which, on the third day from sowing, increased the number of seedlings by 56 per cent., the bacteriorhiza from a soil mixture coming next (52 per cent. increase); whereas the germination of tobacco was most stimulated by the wheat bacteriorhiza which gave an increase of 29 per cent. in the number of seedlings on the sixth day. The inoculations also caused an increased vigour in the seedlings. In wheat seed-grain steeped and allowed to swell in a suspension of the various organisms the greatest effect was that of the bacteriorhiza from the soil mixture, which gave an increase in the number of sprouted seeds of 28 per cent., while the wheat bacteriorhiza only gave 18 per cent., and the bean bacteriorhiza 12 per cent.

The specificity of the action of the various bacteriorhizal complexes was confirmed on other material, and is stated to be in full conformity with previous work by the author, which showed the strict individuality of the different groups of plants with respect to biochemical processes that occur in their rhizospheres. The experiments are considered to indicate that the action of the micro-organisms is a phenomenon of the hormonal type and not a modification of the nutritional regime.

KUPREWICZ (V. F.). К физиологии больного растения. (Физиологические данные о вредоносности некоторых грибных и вирусных болезней культивируемых растений.) [Contribution to the physiology of the diseased plant. (Physiological data on the injuriousness of certain fungal and virus diseases of cultivated plants.)]—*Acta Inst. bot. Acad. Sci. U.R.S.S.*, Ser. iv, (*Bot. exper.*), *1936*, 2, pp. 283–345, 1 fig., 10 graphs, 1936. [English summary.]

This is a reprint of the author's thesis [which has already been

noticed: *R.A.M.*, xiv, p. 52] on the effect of disease on the physiological processes in plants.

DIMOCK (A. W.). **Variation in a species of Fusarium induced by high concentrations of zinc salts.**—*Zbl. Bakt.*, Abt. 2, xcv, 13–17, pp. 341–347, 2 figs., 1 diag., 1936.

During an intensive two-year study at California University of a monospore strain of a *Fusarium* from gladiolus, tentatively identified as *F. oxysporum* var. *gladioli* [*R.A.M.*, xi, p. 356], sectoring occurred exclusively on standard nutrient media containing high concentrations of zinc chloride (7·5 gm. per l.), sulphate, or nitrate (4·5 gm.). Both the parent and the four aberrant strains were shown by monospore culture studies to be pure and homocaryotic. A single isolated spore of one of the mutants gave rise to a further variant, apparently as a sequel to aberrant mitosis or to 'spontaneous' gene mutation taking place during or shortly before spore formation. The mechanism of action of the zinc ion is interpreted either as an alteration of the self-perpetuating, extra-nuclear inclusions of the cytoplasm of the parent cells, or as a modification of the genic constitution of the nucleus [cf. ibid., xiv, p. 711].

STEVENS (N. E.). **A note on the temperature relations of certain fungi.**—*Mycologia*, xxviii, 6, pp. 510–513, 1 graph, 1936.

Advantage was taken of an unusually accurate series of temperature chambers to study the temperature relations and, in particular, the relative growth in culture of species of *Diplodia* common on maize and of a number of apparently closely related fungi. The organisms tested were *D. zeae* [*R.A.M.*, xvi, p. 246], *D. macrospora* [loc. cit.], *Physalospora obtusa*, *D. megalospora*, *Botryosphaeria ribis* [see above, p. 302], *B. melanops* [ibid., xvi, p. 136], *P. mutila* [ibid., xv, p. 726], *P. glandicola*, *D. natalensis* [ibid., xvi, p. 219], and *D. sarmentorum* [ibid., xv, p. 726].

A comparison of the temperature relations of these fungi with their geographical distribution showed that the maize fungi have a relatively narrow temperature range, making no growth at 10° or 35° C.

Within the 'Melanops' group (*Botryosphaeria* and *Physalospora*) the only species showing any considerable growth at 35° were *B. ribis* and *D. natalensis*, both of which are widely distributed in the tropics. Species abundant in north temperate regions, i.e., *P. glandicola*, *P. obtusa*, *P. mutila*, *D. sarmentorum*, *D. megalospora*, and *B. ribis* all showed good growth at 10°, with optima about 25° or 30°. The widest temperature range was shown by *B. ribis*, which also has the greatest known north and south distribution.

Included in the study were three 'pairs' of species of similar appearance but with one fungus in each pair having much larger pycnospores than the other, i.e., *D. zeae* and *D. macrospora*, *P. obtusa* and *D. megalospora*, and *B. ribis* and *B. melanops*. It was noted that the temperature ranges of the two members of each pair were similar, but the growth rate of the large-spored organism was much slower than that of the other on all media; also, the larger-spored forms were apparently much less common and less widely distributed in nature than the others.

VERONA (O.). **Sul comportamento dei microorganismi di fronte ad alcune sostanze coloranti, con particolare riferimento al verde malachite ed alla possibiltà di una sua applicazione fitoterapica.** [On the behaviour of micro-organisms towards certain colouring agents, with special reference to malachite green and the possibility of its application in phytotherapy.]—*Boll. Ist. agr., Pisa,* xi, pp. 421–472, 2 figs., 2 graphs, 1935. [Received February, 1937.]

This is an expanded version in Italian of a paper already noticed from another source [*R.A.M.*, xv, p. 244].

WARTENBERG (H.) & HEY (A.). **Die elektrometrische Pflanzgutwertbestimmung der Kartoffelknolle. IV. Mitteilung. Das Redoxpotential der Gewebebreiaufschlämmung der Kartoffelknolle als Kennziffer des Abbaues.** [The electrometric determination of the seed value of the Potato tuber. Note IV. The reduction-oxidation potential of the pulped tissues of the Potato tuber as the coefficient of degeneration.]—*Phytopath. Z.*, ix, 6, pp. 531–569, 11 figs., 5 graphs, 1936.

Continuing their investigations on the electrometric method of determining the health (from the standpoint of degeneration diseases) of potato seed-tubers [*R.A.M.*, xvi, p. 270], the authors give a detailed account of experiments, in which they halved the tubers of a large number of varieties of different origin, one half being immediately reduced to a pulp for the purpose of determining its reduction-oxidation potential, while the other was preserved for planting in the greenhouse or in the field. The results of the tests, which have been carried out for several years, showed from the first that only tubers in the winter resting stage may be usefully employed for the determinations, since only in the pulp from such tubers does an indifferent metal electrode assume a constant potential with the same properties as the balanced potential of a reversible system. It was found that the constant potential values may be different from tuber to tuber, and these differences are not due to differences in acidity, but may be explained by unequal reduction-oxidation relationships. It was further shown that the pulp prepared from tubers affected with degeneration always gave more negative potential values than the pulp of healthy tubers of the same variety and origin, the frequency curves of the reduction potential values being constant for each variety from the same locality. The curves for healthy and diseased tubers overlap for a certain region, which is termed the 'critical zone', since the potential values included within this zone cannot serve as a safe indicator of the health or otherwise of the corresponding tubers. The closer the potential value determined stands to the middle point of this zone the less reliable it is, and the middle point is termed the 'limit value', from the standpoint of health determination. The method discussed, therefore, requires the preliminary determination for each potato variety and origin of three potential ranges, namely, the range for the healthy tubers, the critical zone, and the range for the degenerated tubers.

A separate table shows the striking concordance there was between the results obtained by the electrometric method in the laboratory,

and the health condition of the preserved tuber halves which were sown in the field. A statistical estimation of the proportion of diseased tubers among the tubers with potentials falling in the critical zone gave an average of 36·90 per cent. diseased, the actual average obtained in the field from the corresponding halves being 34·90 per cent. diseased, with a correlation coefficient of r = +0·901, demonstrating the validity of the calculation.

HORNIG (G.). **Vergleichende Untersuchung verschiedener Methoden zur Bestimmung des Abbaugrades bei Pflanzkartoffeln.** [Comparative study of various methods for the determination of the degree of degeneration in Potato seed-tubers.]—*Pflanzenbau*, xiii, 6, pp. 209–234, 1936.

A brief, tabulated account is given of the author's comparative tests of some of the different methods which have recently been suggested for the determination of the degree of infection of potato seed-tubers with degeneration [virus] diseases, the experiments being made with healthy and diseased tubers of the Sickingen and Erdgold varieties from various localities. Only a low degree of correlation could be established between a high content of starch in the mother-tuber and high yield, or vice versa. Seed-tubers with a high content in dry substance for the most part gave better yields than those with a lower content, and content in nitrogen appeared to be inversely proportional to the yield. The contents of potash, phosphoric acid, lime, sulphuric acid, and chlorine in the ash showed no definite relation to health, but healthy tubers showed a higher osmotic pressure in the autumn than diseased. The copper test [*R.A.M.*, xv, p. 821] gave useful indications in 60 per cent. of the trials with the Sickingen variety, but constantly failed with Erdgold. Neither quartz lamp analysis of disks cut from tubers nor P_H values showed any difference between healthy and diseased material. Wartenberg's and Hey's electrometric method [see preceding abstract] gave useful results with strongly differentiated material of the 'Zwickauer Early Yellow' and 'Erdgold' varieties, but not with Sickingen. The healthy tuber juice of the last-named variety assumed in a phenol solution a darker discoloration than that of virus-diseased tubers, but no difference in degree of discoloration could be observed between the juice of healthy and diseased tubers of the Sickingen variety.

MURPHY (P. A.). **Nature and control of Potato virus diseases.**—*Nature, Lond.*, cxxxviii, 3501, p. 955, 1936.

In this review of a discussion at the British Association on 'Scientific aspects of potato growing', the writer states that the simple, yellow, and veinal mosaic diseases, due to viruses X, F, and A, respectively, are normally passed over in the field, whereas veinal mosaic or leaf drop streak (Y), interveinal mosaic (X+F), crinkle (X+A), rugose mosaic or leaf drop streak (X+Y) make up the mosaic of the practical man [*R.A.M.*, xvi, p. 117]. The latter group are caused by a virus transmitted by *Myzus persicae*, either alone or in combination with X. Double virus aucuba mosaic (A+F) is not very common. The problem of control resolves itself therefore into the control of *M. persicae* and

of the almost ubiquitous virus X. The vector of X is unknown and it is uncertain whether it is economically possible or necessary to control it as well as the aphid-borne viruses. The useful life of a variety depends on its reactions to local viruses, carriers and strong reactors escaping best. Virus Y is rare except in south-eastern England and its control depends upon the use of Scottish and Irish seed potatoes.

SANFORD (G. B.). **Studies on Rhizoctonia solani Kühn. I. Effect of Potato tuber treatment on stem infection six weeks after planting.** —*Sci. Agric.*, xvii, 4, pp. 225–234, 1936. [French summary.]

The experiments discussed in this report were carried out under a wide range of field conditions in Canada and British Columbia in an attempt to determine the controlling effect of the disinfection of potato tubers (mainly of the Early Ohio variety) with mercuric chloride (1 in 500 for five minutes) on the development of *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xvi, pp. 57, 122, 158], as judged from the severity of the lesions on the stems and the percentage of plants without stem lesions 42 days after planting. The tabulated results showed that in 24 out of a total of 34 tests (70 per cent.) the severity of infection was significantly greater in the plants from untreated tubers heavily infected with sclerotia of *C. solani* than in those from clean, disinfected tubers; there was a tendency for plants raised from apparently clean and non-disinfected tubers to be more severely attacked than those from the treated tubers. The evidence indicated that tuber disinfection would have been valuable in 91 per cent. of the experiments. A basic, although variable, infection was found to be present in all the soils tested, whether of glacial origin or of the black prairie loam type, and independently of the previous crop or of summer fallow. In the 34 experiments an average of 28·7 per cent. of the plants from tubers heavily infected with sclerotia had lesions attributable to the sclerotia, and, adding the percentage infection arising from the soil, the average was 42 per cent. The method of tuber disinfection adopted apparently caused as many missing hills as the fungus from the sclerotia, the average percentage of missing hills in all the experiments being approximately 2·5.

NÉMEC (A.). **Über den Einfluss des Krebsbefalles auf den Magnesiastoffwechsel der Kartoffelknollen.** [On the influence of wart disease on the magnesia metabolism of Potato tubers.]—*Ernähr. Pfl.*, xxxii, 24, pp. 413–416, 1936. [English and Spanish summaries on p. 432.]

The outcome of the writer's experiments in Czecho-Slovakia on the effect of wart disease (*Synchytrium endobioticum*) on the magnesia metabolism of potato tubers has already been summarized from another source [*R.A.M.*, xvi, p. 120].

FOËX (E.) & LANSADE (M.). **Deux maladies de la Pomme de terre. I. Une fusariose. II. Une bactériose.** [Two Potato diseases. I. A fusariosis. II. A bacteriosis.]—*Ann. Sci. nat., Bot.*, Sér. X, xviii, 2, pp. 141–163, 12 figs., 1936.

This is an expanded account of the writers' studies on the potato

diseases caused by *Fusarium oxysporum* in Brittany and Morocco and *Bacterium xanthochlorum* in Brittany, a preliminary note on which has already been published [*R.A.M.*, xv, p. 680].

Yoshii (H.). **Pathological studies on Rice blast, caused by Piricularia oryzae. I. Some studies on the physiology of the pathogene. II. On the mode of infection of the pathogene.**—*Ann. phytopath. Soc. Japan*, vi, 3, pp. 199–218, 1 pl., 15 figs., 1936. [Japanese, with English summary.]

Piricularia oryzae, the agent of rice blast in Japan [*R.A.M.*, xvi, p. 202], is stated to be incapable of growth under anaerobic conditions. The optimum temperature for the development of the fungus is 28° C. It does not reduce nitrate and appears to be injured by nitrite. Glucose, cellulose, and pectin are valuable sources of carbon. Oxidase and dehydrase were detected in cultures of the organism.

In inoculation experiments with *P. oryzae* on young tillering rice blades, the fungus first forms brown appressoria on the host and then penetrates the epidermal cell through the outer membrane. The motor and accessory stomatal cells appear to be the most susceptible to the fungus. The ears are penetrated similarly to the blades but less readily, infection taking place primarily through the long cells on the upper part of the assimilatory parenchyma near the nodes of the racheae and through those of the bracts projecting from the basal nodes of the ears. Penetration is effected by a slender infection hypha which emerges from the centre of the appressorium, pierces the outer layer of the epidermal membrane, and enters the cavity of the first cell encountered. On reaching the inner surface of the membrane the hypha forms a small vesicle, from which are extruded branches of new vegetative hyphae.

Kuilman (L. W.). **Symptomen van de mentek-ziekte van de Rijstplant.** [Symptoms of the 'mentek' disease of the Rice plant.]—*Landbouw*, xii, 5, pp. 225–245, 3 figs., 1 graph, 1936. [English summary.]

The foliar chlorosis associated with the 'mentek' disease [root rot] of rice in Java [*R.A.M.*, xiv, pp. 152, 743] being a transient and ambiguous manifestation, attention was concentrated on the possible development of more specific symptoms under given environmental conditions. In a field trial at Pekalongan plants of the susceptible Temas variety transplanted in December and January, 1935–6, showed a striking curtailment of the leaf blades and sheaths, accompanied by the typical yellowing; earing was frequently incomplete, and the stalks, when formed, were abnormally short. In water culture experiments these symptoms were successfully reproduced by the withdrawal of potash from the nutrient solution, the stunting of the leaves beginning to be noticeable at the 40th day, while the older foliage became markedly chlorotic. The latter feature alone resulted from nitrogen or phosphate deficiency, so that the leaf curtailment is evidently a specific sequel to potash starvation in pot tests, though whether the shortage operates similarly in the field has yet to be investigated. If so, the disorder can probably be prevented by the accumulation of a

sufficiency of potash by the seedlings during their cultivation in the nursery.

Suzuki (H.). **Studies on bacteria internal of Rice seeds. V. Influence of hydrogen ion concentration of the media, in which the bacteria are suspended, on the thermal death time.**—*Ann. phytopath. Soc. Japan*, vi, 3, pp. 219–253, 15 graphs, 1936. [Japanese, with English summary.]

A fully tabulated account is given of the writer's studies on the influence of the hydrogen-ion concentration of the medium (bouillon nutrient broth) on the 'thermal death times' of *Bacillus* A, B, and C, found in the interior of rice seeds in Japan [*R.A.M.*, xvi, p. 201]. Irrespective of the strains tested and of temperature relations, the 'thermal death times' appeared to be longest at P_H 7 to 7·2, intermediate at 5, and shortest at 8·6 to 8·8. *Bacillus* C showed the strongest resistance to heat and A (except for one strain from Ogami rice) the weakest.

Pfältzer (A.). **Bruine binnenbast.** [Brown bast.]—*Bergcultures*, x, 50, pp. 1565–1573, 1936.

A review is given of the history, symptoms, economic importance, etiology, and control of brown bast of *Hevea* rubber [*R.A.M.*, xii, p. 80], with special reference to Dutch East Indian conditions.

Sreenivasaya (M.). **The present status of the spike problem of Sandal - Santalum album Linn.**—*Proc. Soc. biol. Chemists (India)*, i, pp. 27–29, 1936.

In this review of the present status of research on spike disease of sandal [*R.A.M.*, xvi, p. 138] the author states that a technique devised for recognizing plants with masked symptoms has made possible the complete destruction of all sources of infection. Extensive ecological surveys have resulted in the discovery of resistance-imparting hosts, and experiments in spiked forest areas where sandal is grown in association with specific hosts have definitely demonstrated that resistance can be imparted [ibid., xiv, p. 478]. Furthermore, as the disease occurs only during well-defined seasons, control need only be practised in certain months of the year. The results obtained are considered to afford every hope that eradication measures against the disease [ibid., xiv, p. 539] will be successful.

Heim (R.) & Bouriquet (L.). **La maladie de l'apoplexie du Giroflier à Madagascar.** [The apoplexy disease of Cloves in Madagascar.]—*C.R. Acad. Agric. Fr.*, xxiii, 1, pp. 25–29, 1937.

Clove trees in the east of Madagascar and on the island of St. Mary have been observed to suffer from a disease termed 'apoplexy', presenting certain analogies with the 'sudden death' of the crop in Zanzibar [see above, p. 301]. A fungus resembling *Hypochnus* coating the tap-roots, and a *Pythium*-like mycorrhizal fungus are common to both healthy and diseased trees and cannot be suspected as the agents of apoplexy. The true origin of the disorder, which is characterized by the formation of tyloses in the vessels, is probably to be sought in the

physiological conditions of the environment, such as the conjunction between a stony sub-soil and certain meteorological and topographical factors.

In the same district the cloves also suffer from a true root rot associated with typical rhizomorphs and a mycelium consisting of brown, sparsely septate hyphae, 4 to 6μ in diameter. The foliage wilts and falls and the trees ultimately die. None of the leaf diseases, caused by *Cephaleuros virescens*, *Mycosphaerella caryophyllata*, *Alternaria* sp., and *Capnodium brasiliense*, is of any economic importance.

LUTHRA (J. C.). **India: some new diseases of Sugar Cane discovered in the Punjab.**—*Int. Bull. Pl. Prot.*, x, 12, p. 262, 1936.

Cytospora sacchari [*R.A.M.*, xiv, p. 348; xvi, p. 207] has been found on the Coimbatore varieties 223, 312, 313, 385, 392, 394, and several others in the Punjab. The symptoms assume a conspicuous form on the rind with formation of spore bodies when the canes are dried or have been buried in the soil. *Cephalosporium sacchari* [ibid., xv, p. 774] causes a wilt of mature plants. Seedling canes are liable to infection by *Helminthosporium* sp., and some cases of root rot have also been observed.

LOCKWOOD (L. B.). **Rhizopus elegans Eidam.**—*Mycologia*, xxviii, 6, pp. 542–546, 1936.

The author points out that the genus *Rhizopus* was established by Ehrenberg in 1820 on a fungus, *R. nigricans*, which he had previously described as *Mucor stolonifer*, and that it is not possible definitely to identify any species now known with *R. nigricans* Ehrenberg.

In the course of a physiological study of the species of the genera *Mucor* (12 species) and *Rhizopus* (18) none of the latter was able to utilize sodium nitrate as a nitrogen source, while all of the former studied utilize it readily. Several *Rhizopus* cultures produced large quantities of lactic acid from glucose, but no *Mucor* gave an appreciable yield of lactic acid.

STEVENSON (J. A.) & CASH (EDITH K.). **The new fungus names proposed by C. G. Lloyd.**—*Bull. Lloyd Libr.* 35, Mycol. Ser. 8, 209 pp., 1936.

This is an annotated list with citations of 56 genera, 1,094 species, and 38 varieties or forms named as new by the late C. G. Lloyd, together with 392 species transferred by him to other genera. A further genus and 7 species omitted are listed on a mimeographed slip.

SCHADE (A. L.). **A preliminary list of the parasitic fungi of Idaho.**—*Plant Dis. Reptr, Suppl.* 95, pp. 77–113, 1936. [Mimeographed.]

A preliminary list is given of 215 fungi and bacteria parasitic on herbaceous plants (mostly cultivated) in Idaho, together with a host index and a bibliography of 62 titles.

MARTIN (G. W.). **A key to the families of fungi exclusive of the lichens.**—*Univ. Ia Stud. nat. Hist.*, xvii, 3, pp. 83–115, 1936.

The dichotomous key to the families of fungi here presented has been developed during the past ten years in connexion with the course in

mycology given at the State University of Iowa and is an attempt to provide a concise outline of the classification of these organisms to supplement those available in the numerous reference volumes on the subject, a partial list of which is appended. With a few exceptions, the many new families proposed in recent years have been excluded from the synopsis. The key is supplemented by a glossary of mycological terms.

Gonçalves da Cunha (A.). **Uredíneas de Portugal.** [Uredineae of Portugal.]—*Bol. Soc. broteriana*, xi, Sér. ii, pp. 169–265, 1936.

An annotated list, supplemented by a bibliography of 49 titles and by fungus and host indexes, is given in alphabetical order of 178 Uredineae collected on economic and ornamental hosts in Portugal, on the lines of Gonzalez Fragoso's flora of the rusts of the Iberian Peninsula [*R.A.M.*, iv, p. 636].

Lepik (E.). **Einige bemerkenswerte Uredineenfunde aus Estland.** [Some noteworthy finds of Uredineae from Estonia.]—*Ann. mycol., Berl.*, xxxiv, 6, pp. 435–441, 1936.

An annotated list is given of 15 Estonian Uredineae of general phytogeographical interest, several of which are new to the country, including *Uropyxis mirabilissima* [*Cumminsiella sanguinea*: *R.A.M.*, xv, p. 230] on *Mahonia* [*Berberis*] *aquifolium* and *Puccinia antirrhini* on *Antirrhinum majus* [ibid., xvi, p. 256]. *Cronartium asclepiadeum* (*C. flaccidum*) [ibid., xv, p. 617] was observed on *Vincetoxicum rehmanni*, a new host.

Lavroff (N. N.). Новые и более редкие головневые грибы сем. **Ustilaginaceae** северной и центральной Азии. [New and less common smut fungi of the Ustilaginaceae in Northern and Central Asia.]—Reprinted from *Trav. Inst. sci. Biol. Univ. Tomsk*, ii, 35 pp., 1 pl., 3 graphs, 1936. [Latin summary.]

This paper consists mainly of an annotated list of 50 species and varieties of smuts (Ustilaginaceae) recorded from northern and central Asia, all on wild plants except *Ustilago trichophora* var. *pacifica* Lavroff (syn. *U. panici-frumentacei*) [*R.A.M.*, xii, p. 10] on *Panicum frumentaceum* [*Echinochloa frumentacea*]. A number of species and varieties are described as new (with Latin diagnoses), and a new genus, *Tranzscheliella*, is erected for a fungus on *Stipa* spp. with chlamydospores bearing one or two hyaline ellipsoidal lateral appendages, frequently serving to unite the spores in clumps of 10 to 20. The genus *Sorosporium* is divided into two sub-genera, namely, *Eusorosporium*, with light coloured, frequently ochraceous spores agglomerated into compact balls, and *Sorosporella*, with dark spores united in less compact balls.

Sydow (H.). **Novae fungorum species.—XXIV.** [New species of fungi.—XXIV.]—*Ann. mycol., Berl.*, xxxiv, 6, pp. 411–422, 1936.

Continuing his critical annotations of specimens of fungi collected in various parts of the world [*R.A.M.*, xv, p. 398], the writer gives Latin and German diagnoses of a further nine species, of which the following

may be mentioned. Well-defined, brown to reddish-brown lesions, 1 to several cm. in length, extending from the tip along the margins, are formed on the fading leaves of a cultivated *Rhododendron* (?*R. ponticum*) in Westphalia by *Sphaerulina rhododendri* n.sp.

Living leaves of *Ulmus davidiana* in Hopei, China, are attacked by *Stegophora aemula* n.sp., the stromata of which are aggregated in irregular groups, 3 to 10 mm. in diameter, on both surfaces, producing ill-defined, dark rust- or reddish-brown lesions. The depressed and obliquely ellipsoid or spherical, laterally ostiolate perithecia, 200 to 320 μ in diameter, mostly occur in groups of 2 to 5 in a stroma. The numerous clavate or somewhat fusiform asci measure 36 to 50 by 7 to 10 μ and contain eight elongated-clavate, straight or slightly curved, uniseptate ascospores, 8 to 12 by 4 to 5 μ, the basal cell almost hemispherical or bluntly conical, and measuring about 2·5 μ both in length and width. This species differs from the closely related *Gnomonia ulmea* [ibid., xiv, p. 203] in the mode of growth of its fructifications, its relatively poor stromatal development, and active parasitism on elm leaves in contrast to the semi-saprophytic habit of the North American fungus.

Polystigma deformans n.sp. involves entire shoots of young apricots at Peiping [Pekin] in a witches' broom-like malformation, inducing a dark reddish-brown discoloration of the leaves, the tissue of which is ultimately almost completely destroyed by the extensive stroma. The slightly depressed-globose or broadly ellipsoid perithecia, 200 to 280 μ in diameter, are furnished with an obtusely conical or papilliform ostiole, up to 70 by 50 μ, at the apex of which the cells abruptly turn dark olive- or blackish-brown and form a small, spherical, epidermal clypeus. The clavate, stipitate asci measure 45 to 55 by 13 to 17 μ and contain eight elongated-oval or ellipsoid, straight, unicellular, hyaline ascospores, 12 to 15 by 5 to 6 μ. The conidial stage develops in locules on a stroma, and the falcate, S-, or spiral-shaped conidia, 30 to 48 by 0·6 to 1 μ, are borne on rod-shaped, apically tapering conidiophores, 10 to 15 or up to 17 by 2 to 2·5 μ, and are exuded in bright amber- or pale orange-yellow cirrhi.

Dying leaves of *Paspalum dilatatum* in the Argentine bore large, amphigenous, greyish-brown spots caused by *Ascochytula paspali* n.sp.

Muller (A. S.) & Chupp (C.). **Uma segunda contribuição a 's Cercosporae de Minas Geraes.** [A second contribution to the *Cercosporae* of Minas Geraes.]—*Arq. Inst. Biol. veg.*, iii, 1, pp. 91–98, 1936. [English summary.]

An annotated list is given of 52 species of *Cercospora* collected in Minas Geraes, Brazil, during the last two years [*R.A.M.*, xv, p. 59]. Twelve are new to science and are furnished with diagnoses in Portuguese and with critical and taxonomic notes. *C. castaneae* n.sp. forms large, grey lesions with irregular margins on chestnut (*Castanea sativa*) foliage; an extensive stroma is produced, and the obclavulate, curved, indistinctly septate, greenish-olivaceous conidia, 30 to 50 by 2 to 3 μ, are borne on pale grey or olivaceous-fuliginous, undulate conidiophores, 3 to 4 μ in diameter, some 250 by 4 to 6 μ. *C. dianthi* n.sp. attacks the leaves, pedicels, and floral elements of *Dianthus*. *Jasminum grandiflora*

is parasitized by *C. jasminicola* n.sp. *C. krugiana* n.sp., which forms irregular, angular, dark grey spots, 0·5 cm. in diameter, on the upper leaf surfaces of *Boehmeria nivea*, is characterized by grey, distinctly septate, sparsely fasciculate conidiophores, 30 to 110 by 4·5 to 6 μ, bearing obclavulate, usually somewhat curved, hyaline conidia truncate at the base, tapering at the apex, 40 to 110 by 2·5 to 4 μ. *C. krugiana* differs from *C. boehmeriae* in the absence of a stroma and of dense fascicles of conidiophores, the colour of which is quasi-hyaline in the latter, while the conidia are faintly tinted and frequently subcylindrical. *C. leguminosae* Chupp & Linder occurs on *Crotalaria stipularis*. *Sida micrantha* is liable to infection by *Cercospora micranthae* n.sp. The lesions formed on poppy (*Papaver* sp.) by *C. papaveri* n.sp. are circular or irregular, 3 to 8 mm. in diameter, sometimes with an ashen centre bordered by a dark line. *Passiflora* sp. bears irregular, angular, grey spots due to *C. passiflorae* n.sp., which is characterized by pale olivaceous, almost or quite straight conidiophores, 10 to 50 by 3 to 4 μ, producing mainly cylindrical, pale olivaceous, indistinctly 1- to 5-septate conidia, truncate at the base, tapering towards the apex, and measuring 40 to 60 by 2·5 to 4 μ. *C. petuniae* n.sp., the agent of dark grey, narrow-edged, sometimes raised, circular or semi-circular spots on *Petunia* sp., resembles *C. canescens* [ibid., xv, pp. 344, 830] in its obclavulate, straight or slightly curved, hyaline conidia, 50 to 130 by 3 to 4·5 μ. *Wistaria* sp. shows the presence of subcircular or angular, pale yellow, gradually darkening spots, with white centres and orange or dark grey margins, caused by *C. wistariae* n.sp.

GHIMPU (V.). **Afecțiunile patologice și inamicii Tutunului în România și diferite experiențe in 1936.** [Pathological conditions and pests of Tobacco in Rumania and various experiments during 1936.]—*Bul. Cultiv. Ferment. Tutun.*, xxv, 4, pp. 400–406, 1936. [French summary.]

During 1936 tobacco in Rumania became affected by green mosaic [*R.A.M.*, xiv, p. 685], yellow mosaic [ibid., xvi, p. 129] and ring spot [ibid., xv, p. 831]. It was found that only the virus of green mosaic remained viable in tobacco offal from the drying and fermentation sheds after five years. Ninety per cent. of the plants found to be virus-infected at the beginning of vegetation were dwarfed and useless for planting. Disinfection of the hands by washing twice with soap proved to be effective, whereas alcohol and mercuric chloride were unsatisfactory.

Severe losses were caused in many plantations by *Bacterium tabacum* [ibid., xvi, p. 214]. *Rhizoctonia* [*Corticium*] *solani* occurred in seed-beds [ibid., xv, p. 323], and *Phyllosticta nicotianae*, *Alternaria tenuis*, and *Erysiphe cichoracearum* in the field.

BEST (R. J.) & SAMUEL (G.). **The effect of various chemical treatments on the activity of the viruses of Tomato spotted wilt and Tobacco mosaic.**—*Ann. appl. Biol.*, xxiii, 4, pp. 759–780, 1 pl., 2 graphs, 1936.

In continuation of their studies on the inactivation of the viruses of tomato spotted wilt and tobacco mosaic [*R.A.M.*, xvi, p. 68] the authors give an account of experiments the results of which showed

that by excluding free oxygen the concentration of active units of spotted wilt in suspensions stored at 0° C. in a buffer solution of P_H 7 was maintained without loss for 11 hours, while a significant fall in concentration occurred in similar solutions through which air was bubbled. The fact that at room temperatures the virus was fairly rapidly inactivated, though at variable rates, even in the absence of free oxygen, is considered to indicate that inactivation was due to the presence in the infective juice of some oxidized substance, usually present in small but variable amounts, and that it is reduced by certain reducing agents, which arrest further anaerobic inactivation. The addition of these substances in the reduced form yielded suspensions with an E_h (potential at the hydrogen electrode) value of +0·1 volt or less at P_H 7, and of them cystein, in particular, caused a significant increase in the number of lesions obtained. These reducing agents protected the virus against inactivation when exposed to air, in that they prolonged the activity of the inocula for many hours beyond that of the controls. On the other hand, the spotted wilt virus was rapidly inactivated *in vitro* by 0·001 *M* solutions of oxidizing agents which induced in the suspensions a potential greater than +0·2 volts at P_H 7, but, except for methylene blue, not by those which gave a suspension with an E_h value below +0·1 volt. Among the other substances studied, potassium cyanide in 0·01 *M* solution protected the virus both against aerobic and anaerobic inactivation, and mercuric chloride in 0·001 *M* solution caused instantaneous inactivation; catechol, quinol, and phenol alone inactivated the virus in the presence of air, but not if sodium sulphite was also present; it is thought that secondary oxidation products caused the inactivation observed. All attempts to reactivate virus which had been inactivated by exposure to air or with mercuric chloride gave negative results. Evidence is adduced showing that the inactivation observed was due to an action of the agents on the virus itself.

The action of 15 chemicals on tobacco mosaic virus was investigated, but only potassium permanganate and chlorazene induced rapid inactivation. Benzoquinone, iodine, potassium ferricyanide, iodoxybenzene, potassium cyanide (0·01 *M*), and a number of well-known reducing agents covering the potential range down to that of the hydrogen electrode at P_H 7, did not affect the activity of the virus over the relatively short periods of time tested, but potassium bichromate (0·005 *M*) appeared to have a slight inactivating effect after 4 hours' contact. The activity of the virus was not affected by contact with mercuric chloride for a few hours, complete inactivation resulting, however, from contact for longer periods.

BEST (R. J.). **The relationship between the activity of Tobacco mosaic virus suspensions and hydrion concentration over the P_H range 5 to 10.**—*Aust. J. exp. Biol. med. Sci.* xiv, 4, pp. 323–328, 1 graph, 1936.

The percentage inactivation of the tobacco mosaic virus in buffer solutions as estimated by the primary lesion method has been determined for various P_H values over the range from 5 to 10 [*R.A.M.*, xv, p. 531, and preceding abstract]. Inactivation of suspensions of the virus

from *Nicotiana* commenced at a P_H value of about 7·8 and the inactivated fraction became progressively larger with each rise in the P_H values until at 10·2 only about 0·5 per cent. of the virus added remained active. Between the values of P_H 8 and 8·9, corresponding to 21 and 90 per cent. inactivation, respectively, the ratio $[H^+]$/[active virus] [i.e. free hydrogen ions to fraction of virus remaining active] was found to be a constant, but this relationship did not hold good at P_H values below 8. It is concluded that inactivation of the virus is associated with the neutralization of acidic groups. The inactivation is irreversible, reactivation by the readjustment of the P_H value back to 7 being impracticable. The fact that the 'steady state' requires several hours for its attainment suggests the likelihood of intramolecular changes, with the possibility of a series of complex reactions culminating in an irreversible change to a sparingly soluble product with a constant active mass. From a consideration of contemporary views on the nature of certain enzymes it would appear probable that the tobacco mosaic virus represents a protein complex with one or more prosthetic groups, which are inactivated in weakly alkaline solutions to a given extent dependent on the hydrogen-ion or hydroxyl-ion concentration.

Caldwell (J.). **The agent of virus disease in plants.**—*Nature, Lond.*, cxxxviii, 3503, p. 1065, 1936.

In this review of recent work on tobacco mosaic the author states that experiments at Exeter have shown that virus activity seems to be associated more with the activity of growing cells than with the movement of materials from the inoculated leaves. When one group of tobacco plants was inoculated on the youngest available leaf, a second on a half-grown leaf, and a third on the oldest leaf (all the plants being in the 4th to 5th leaf stage), and the inoculated leaves at once covered with tinfoil or black paper, symptoms appeared first on the plants of group one, then on most of those in group two, and rarely on the plants in group three. The inoculated leaves in groups one and two grew rapidly, while the adult leaves of the third group died in a week. It was apparent that the virus moved rapidly out of the younger leaves, this movement being little affected by the movement of food materials into them.

Wyckoff (R. W. G.) & Corey (R. B.). **The ultracentrifugal crystallization of Tobacco mosaic virus protein.**—*Science*, N.S., lxxxiv, 2199, p. 513, 1936.

The authors state that by centrifuging the clear juice from plants infected with tobacco mosaic [*R.A.M.*, xvi, p. 281] at 25,000 r.p.m. they obtained a crystalline deposit presenting an X-ray diffraction pattern indistinguishable from that given by the purified virus protein prepared by chemical means from the juice; this is interpreted as denoting that these two substances are substantially identical.

Bawden (F. C.), Pirie (N. W.), Bernal (J. D.), & Fankuchen (I.). **Liquid crystalline substances from virus-infected plants.**—*Nature, Lond.*, cxxxviii, 3503, pp. 1051–1052, 3 figs., 1936.

By further purification of the crystalline proteins prepared from the

strains of tobacco mosaic virus causing common tobacco mosaic, aucuba mosaic, and enation mosaic the authors have obtained the protein in liquid crystalline states. Sap of mosaic-infected tobacco and tomato plants after centrifuging contains five to ten times as much protein as yielded by healthy plants. This extra protein is precipitated from dilute salt solutions at approximately P_H 3·4 and from neutral solutions with from 10 to 12 per cent. ammonium sulphate. The yield of protein is 1 to 2 gm. per l. of sap. No gross chemical or physical differences were found between the three proteins, each reproducing its characteristic disease when inoculated into susceptible plants. Plants inoculated with 1 c.c. of solution containing 10^{-9} gm. usually became infected, and occasional infections followed inoculations of 10^{-11} gm.

In concentrations over 2 per cent. the highly purified solutions separated into a lower liquid crystalline layer and an upper layer showing optical anisotropy when flowing. The two liquid layers formed gels on drying. X-ray investigations [see preceding abstract] showed a common pattern corresponding to a repeat unit of $3 \times 22{\cdot}2$ A in the crystal, liquid, and gel stages, while other features of the X-ray pattern indicated hexagonal close-packing in the gel stage, and parallel, charged, rod-like molecules in solution estimated to be over 1,000 A in length and about one-tenth as wide. This corresponds with a molecular weight agreeing with Svedberg's estimate of 17×10^6 [*R.A.M.*, xvi, p. 212]. It seems probable, though it has not yet been proved, that these rods are the virus particles.

Gowen (J. W.) & Price (W. C.). **Inactivation of Tobacco-mosaic virus by X-rays.**—*Science*, N.S., lxxxiv, 2189, pp. 536–537, 1 graph, 1936.

The authors state that the results of their experiments [some technical details of which are given] have shown that the survival ratios for purified tobacco mosaic virus [see preceding abstract], as determined by the local lesion method on leaves of *Phaseolus vulgaris*, after exposure to the action of X-rays, follow a simple exponential curve, similar to that which is applicable to the killing of many living entities by X-rays, and especially of *Drosophila melanogaster* sperm. The curve further suggests that the absorption of a single unit of energy in a virus particle is sufficient to cause the inactivation of the particle. A certain parallelism is manifest between the virus particles and genes [*R.A.M.*, xvi, p. 115]; both are estimated to be of the same order of size, are incapable of reproduction outside living cells, produce the same effects, such as, for instance, variegation or mottling in plants, and, under natural conditions, both are capable of mutating to new forms which retain the ability to reproduce themselves. The inactivation of the tobacco mosaic virus by the radiant energy of X-rays and (according to yet unpublished data) of ultra-violet bands in a manner similar to that of genes, also suggests that this energy brings about an alteration in the virus particles comparable to that which takes place in the genes. The virus differs, however, from the latter in being able to move from cell to cell and in being capable of inoculation into the cells of healthy plants.

KOSMODEMIANSKI (V. N.) & LEVYKH (P. M.). Устойчивость сортов Табака и диких видов **Nicotiana** к поражению **Thielaviopsis basicola** (корневая гниль). [Resistance of Tobacco varieties and of wild species of *Nicotiana* to attack by *Thielaviopsis basicola* (root rot).]—*Всесоюзн. научно-исслед. Инст. Табачн. Махорочн. Пром. им. А. И. Микояна* (*ВИТИМ*) [*The A. I. Mikoyan Pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind.* (*VITIM*)], Krasnodar, *Publ.* 132, pp. 5–17, 1936. [English summary.]

A tabulated account is given of the tests of 125 varieties of tobacco of different geographical origin, and of nine wild species of *Nicotiana* for resistance to root rot (*Thielaviopsis basicola*) [*R.A.M.*, xv, p. 751; xvi, p. 130], which were made from 1931 to 1935, inclusive, in the Sotchi [Caucasian littoral of the Black Sea] region. The disease is stated to be widespread wherever tobacco is grown in Russia and the Ukraine, but is most important economically on the north-east and east coasts of the Black Sea, where it causes losses as high as 68·8 per cent. of the crop in some localities, the average annual loss for the whole territory being about 5 per cent. of the total tobacco production. The results showed that the resistance of a variety cannot be accurately estimated solely by its behaviour in the seed-bed or in the field, and counts of diseased plants in the tests were made under both conditions. Grouped by their origin, the tobacco varieties from south-west Russia, the Balkans, Italy, the southern Central European countries, and north-west Africa included the largest number of resistant strains, while the North and South American varieties exhibited the least degree of resistance. Most of the Crimean, Caucasian, and Turkish varieties were more or less susceptible, but a few exhibited a high degree of resistance, including some lines isolated from the Trebizond tobaccos, among which No. 1867 is very promising. Special mention is also made of the Russian varieties Dubeck Derekoyski No. 1728, American No. 1729, Perekonetzki No. 1257, Tyk-Kulak No. 235, and American No. 47, which in the tests did not show over 1 per cent. infection. Among the wild species of *Nicotiana* complete immunity from *T. basicola* was found in *N. glauca*, *N. repanda*, and *N. noctiflora*, while *N. glutinosa* and *N. sylvestris* were weakly susceptible.

BERKELEY (G. H.). **A strain of the virus which causes streak in Tomato.** —*Canad. J. Res.*, xiv, Sect. C, 12, pp. 419–424, 3 pl., 1936.

The results are tabulated and discussed of a two years' comparative study of the symptoms produced by a strain of tomato streak virus 1 found in Ontario (on greenhouse tomatoes and field tobacco) [*R.A.M.*, xv, p. 122], tobacco virus 1 (tomatoes and tobacco) [ibid., xvi, p. 285], and tomato streak virus 1 (from tomatoes and tobacco in Ontario and also from England) on 19 tobacco varieties and 9 other hosts.

On some tobacco varieties tomato streak virus 1 produced primary local necrotic lesions with or without secondary systemic necrosis and stunting, while on others it produced yellow areas followed by secondary systemic mottling without necrosis. The Ontario strain of tomato streak virus 1 produced symptoms identical with those of tomato streak virus 1 on the Standup Resistant, Halley's and Harrow Velvet

tobacco varieties, but on White Burley, Kelley's, Little Orinoco, and Greenwood tobacco the primary local necrotic lesions were followed by systemic mottling with distortion instead of systemic necrosis. On *Nicotiana sylvestris* it produced local necrotic lesions followed by systemic mottling, the mottled leaves in turn becoming slightly necrotic, whereas tomato streak virus 1 on the same host gave rise to local necrotic lesions sometimes followed by systemic necrosis. The Ontario strain of tomato streak virus 1 always produced local necrotic lesions followed by systemic mottling on rubbed leaves of White Burley tobacco, while on petunia it produced necrotic local lesions sometimes followed by systemic necrosis. Tobacco virus 1 produced systemic mottling with some distortion but no local necrosis on all the tobacco varieties tested, petunia, and *N. sylvestris*. It is evident therefore that the three viruses can be readily separated by the symptoms produced on these hosts.

In field inoculations of seven tobacco varieties using plants about 8 in. high tomato streak virus 1 killed off the plants of several varieties in two weeks, whereas the Ontario strain caused only stunting with systemic mottling of leaf tissue on the same varieties. Tobacco virus 1 produced only systemic mottling and stunting on all varieties.

Tests on reaction to heat and ageing showed that tomato streak virus 1, the Ontario strain, and tobacco virus 1 were each viable after six months and rendered inactive after 10 minutes at 90° C. Tobacco virus 1 immunized plants against either of the other viruses. On these grounds it is suggested that tomato streak virus 1 and the Ontario strain of the virus may be strains of tobacco virus 1.

GOIDÀNICH (G.). **Ricerche sulle 'Phytophthorae' del Pomodoro. II. Marciumi del fusto causati da 'Phytophthora infestans' (Mont.). De By. con nozioni sulla specializzazione biologica di questo parassita.** [Researches on species of *Phytophthora* attacking Tomato. II. Stem rots caused by *Phytophthora infestans* (Mont.) De By. with observations on the biologic specialization of this parasite.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 3, pp. 175–182, 2 pl., 2 figs., 1936.

This account of the stem infection of tomatoes in Italy by a physiologic form of *Phytophthora infestans* probably distinct from that attacking the leaves is an expanded version of a paper already noticed from another source [*R.A.M.*, xvi, p. 132].

HILBORN (H. T.) & STEINMETZ (F. H.). **Some epixylous fungi of Maine.** —*Plant Dis. Reptr*, xx, 19, pp. 306–309, 1936. [Mimeographed.]

A list is given of 73 wood-inhabiting fungi collected in Maine from 1933 to 1935.

LIESE (J.). **Über die Hexenbesenbildung der Waldbäume.** [On witches' broom formation in forest trees.]—*Wien. allg. Forst- u. Jagdztg*, liv, 51, p. 230, 3 figs., 1936.

Popular notes are given on the development of 'witches' brooms' in forest trees in Germany, three categories being recognized, namely, the malformations caused by *Taphrina* spp. [*R.A.M.*, vi, p. 586 *et passim*]

on hardwoods, those due to the rust *Melampsorella caryophyllacearum* on spruce [ibid., x, p. 764], and the excrescences induced by hereditary mutations in firs and pines [ibid., xiii, p. 202]. *M. caryophyllacearum* may also be the cause of cankers that considerably reduce the value of the spruce timber, but otherwise the conditions under discussion are of little or no economic importance and do not call for any special silvicultural measures.

GRAHAM (T. W.). **Persistence of Ceratostomella ulmi in stumps of eradicated Dutch Elm diseased trees in New Jersey.**—*Plant Dis. Reptr*, xx, 20, pp. 320–322, 1936. [Mimeographed.]

A survey in April and May, 1936, of the barked, creosoted stumps of elms cut down in New Jersey during 1933 and 1934 in the course of the Dutch elm disease (*Ceratostomella ulmi*) [*R.A.M.*, xvi, p. 217] eradication campaign showed that the fungus was isolated from 11·3 per cent. of the samples, being found on 23·1 per cent. of the living stumps, 4·0 per cent. of those dead, and 11·3 per cent. of those undetermined. None of the sprouts was infected, but *C. ulmi* was isolated from 19 per cent. of the sprouted stumps. Preliminary tests indicated that proper treatment of the stumps with copper sulphate [ibid., xv, p. 327] kills a very high percentage of them and reduces the period of survival of *C. ulmi* in the stumps.

FRON (G.). **La maladie de l'Orme.** [The Elm disease.]—*C.R. Acad. Agric. Fr.*, xxii, 31, pp. 1081–1089, 1936.

In this paper, preceded by an introductory note (pp. 1078–1081) by Lafosse, the writer summarizes the mode of infection and symptoms of the elm disease (*Ceratostomella ulmi*) and describes his experiments near Bordeaux and at Vincennes, Paris, in its control by neutral ortho-oxyquinoline sulphate [*R.A.M.*, xv, p. 584] (sold under the name of cryptonol [ibid., xiv, p. 552] or sunoxol [ibid., xiii, p. 335]). The preparation may be applied by the injection of a solution of 1 in 20,000, by immersion of the roots for six hours in a solution of similar strength, or by the regular watering of the trees at the rate of 10 l. per tree of a solution of the same concentration. The last-named method has been used with promising results on 17 trees of *Ulmus vegeta*, the treatments being given at fortnightly intervals from 15th May to mid-September; observations on the recovery of these elms are still in progress.

Summary of legislation affecting the introduction of plants etc. in Mauritius.—3 pp., 1936.

Proclamation 10 of 1936 [cf. *R.A.M.*, viii, p. 480], superseding Proclamations 40 of 1928 and 25 of 1932, prohibits the importation into Mauritius from all countries of earth and leaf and garden mould, live plants or any part thereof of all kinds in any description of earth or mould, dung or animal droppings (except from Rodrigues, whence a permit is required, and excluding guano), forage, timber with the bark adhering, and (from Réunion only) plant seeds for use as green dressing. Subject to official permission and inspection the importation is authorized of sugar-canes and cuttings thereof, live plants and all parts thereof, and all seeds and fresh fruits. Potatoes

from all countries must be accompanied by a duly authenticated certificate guaranteeing the absence of *Synchytrium endobioticum* from the place of cultivation.

Colony of Sierra Leone. Order in Council No. 5 of 1936.—6 pp., 1936.

The order dated 11th April, 1936, prohibits the importation of soil into Sierra Leone except with the permission of the Director of Agriculture. Apart from seeds from temperate countries and products for consumption, the importation from the Gambia, Gold Coast, and Nigeria of plants and seeds of avocado, cacao, cotton (free from lint), sugar-cane, and all species of *Musa* is permitted only with the consent of the Director of Agriculture, and of citrus, guinea corn [*Sorghum vulgare*], maize, mango, millets, rice, and tobacco only by the Department of Agriculture for scientific purposes. All consignments of plants and seeds from other countries must be certified free from disease; importation from such countries of plants and seeds of cassava, coco-nut, kola [*Cola acuminata*], sweet potato, yam, and rubber is permitted only under permit, and plants and seeds of avocado, cacao, citrus, coffee, cotton, ginger, guinea corn, maize, mango, millets, oil palm, pineapple, pulses, rice, sugar-cane, tobacco, all species of *Musa*, and all plants from Central and South America and West Indies and other countries where witches' broom of cacao [*Marasmius perniciosus*] is known to occur, may be imported by the Department for scientific purposes only.

Importation of Plants Regulation Ordinance, Gold Coast, No. 18 of 1936. Regulations No. 25 of 1936.—6 pp., 1936.

These regulations prohibit the importation of all plants in soil, all plants from Central and South America, Trinidad, and all countries where witches' broom of cacao [*Marasmius perniciosus*] is known to occur except plants required by the Department of Agriculture for scientific purposes, all coco-nuts in husk from Central and South America, Trinidad, Grenada, and St. Vincent, all coffee in cherry unless certified free from mealy pod disease [*Trachysphaera fructigena*], and all cotton seed except such as required by the Department for scientific purposes. The importation of plants and seeds of cacao, cotton, cassava, oil palms, and all species of *Musa* and *Citrus* (comprising Group A) are permitted from countries included in the Plant Interchange Schedule [viz., Gambia, Nigeria, Sierra Leone] only under permit, which is not required for plants and seeds of coco-nut, kola [*Cola acuminata*], groundnuts, yams, guinea corn [*Sorghum vulgare*], millets, maize, rubber, coffee, rice, and pulses (Group B). Importation from countries outside the Schedule of Group A plants shall only be made for scientific purposes and of Group B plants only under permit, excepting coffee, rice, and pulses for consumption. The ports of entry for plant imports are Accra, Winneba, Cape Coast, Saltpond, and Takoradi. The Plants (Injurious Pests) Ordinance, 1923, is repealed.

The Plant Importation and Regulation Ordinance, Gambia Colony, No. 2 of 1936. Regulations No. 11 of 1936.—11 pp., 1936.

This Ordinance and the Regulations made under it are the counter-

part of those of the Gold Coast [see preceding abstract]. The lists of totally prohibited and scheduled plants are the same.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, xi, 2, pp. 30–31, 32, 1937.

CHILE. Decree No. 628 of 21st October, 1936, published in the *Diario Oficial* of 7th November, provides for the control of citrus gummosis (*Phytophthora citrophthora*) by the prohibition of propagation for commerce of sweet oranges (*Citrus sinensis*) and lemons (*C. limonum*) by means of seeds, cuttings, layers, or shoots. The only citrus plants eligible for sale are those grafted on sour or Seville oranges (*C. aurantium*) propagated solely by seeds, the grafting being effected at a minimum height of 30 cm. from the ground, and the grafted shoot not being allowed to branch less than 20 cm. from the site of grafting. Any material contravening these regulations will be treated, and if necessary destroyed, at the owner's expense, by the Plant Health (Sanidad Vegetal) Service.

ALGERIA. Potato tubers infected by wart disease (*Synchytrium endobioticum*), or any other disorder subject to official regulations, attacked by dry rot (*Fusarium*), bacterial wet rot, *Phytophthora infestans*, or showing serious damage in a proportion exceeding 3, 4, or 5 per cent. for average tuber weights of 100, 65 to 100, and under 65 gm., respectively are deemed to be unsuitable for planting, and the sale of such tubers for seed is prohibited in Algeria by a Decree of 17th December, 1936.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst*, ix, 1, pp. 10–11, 1936.

SAXONY (Province of), Magdeburg district. An Order of 4th November, 1936, effective as from the 14th (date of publication), provides for the control of wither tip of sour cherries (*Sclerotinia cinerea*) [*S. laxa*: *R.A.M.*, xiii, p. 247] by the excision and burning of infected material coupled with judicious pruning and treating the wounds with oil paint. These measures must be carried out by 10th September each year.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Amendment of regulations governing the entry of Potatoes into the United States.—2 pp., 1936.

Under the terms Amendment No. 3 (1st December, 1936) to the regulations governing the importation of potatoes into the United States (revised) [*R.A.M.*, i, p. 240], potatoes may be imported free of all restrictions until further notice from the Dominion of Canada and Bermuda, and from the States of Chihuahua and Sonora, and the Northern Territory of Baja (formerly designated Lower) California, Mexico (through certain specified ports only) if found free from dangerous diseases and pests on inspection by a qualified representative of the United States Department of Agriculture. This revision further revokes the unrestricted importation of foreign potatoes into the Territory of Hawaii, to which the same regulations are henceforth applicable as to the continental United States and Porto Rico.